PHARMACOGNOSY-II

SIR H ASEEB LECTURES

3rd Profession

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Alkaloids

Definition:- Naturally occuring nitrogenous compound, mostly obtained from plants which have physiological and pharmacological effects on humans and animals.

Why Alkaloid Are Basic?:- Because they have lone pair of electron and can donate it.

Alkaloids from Animals:-

* **Animal responsible:-** Amphibians (Frog and toads)

Poisonous frog and toads have alkaloid nature.

Alkaloids from Plants:- They are in 1000 and 100s.

In Start Alkaloids Are isolated in:-

1803 ⟶ Narcoline

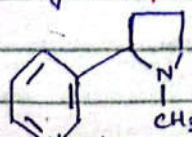
1816 ⟶ Morphine

How Alkaloid Form In Plants?

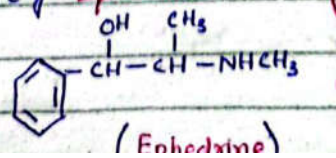
Alkaloids have Nitrogen in there structure and that Nitrogen obtained from those Amino Acid whose having Nitrogen.

Broadly Alkaloid Have 03 Types:-

1. Typical
(True alkaloids)
- Synthesized in plant from AA.
- N is present inside Heterocyclic Ring
- e.g Morphine, Nicoline

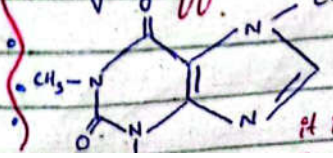


2. Proto
(Alkaloidal Amines)
- —
- —
- Nd present inside HC Ring.
- e.g Ephedrine



(Ephedrine)

3. Atypical
(Pseudoalkaloids)
- Not synthesized from Amino Acid
- N is part of Heterocyclic Ring.
- e.g Caffeine



Overall it is purine

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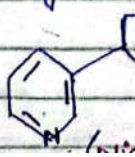

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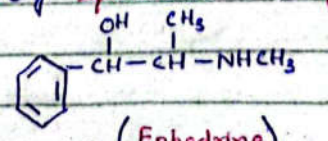

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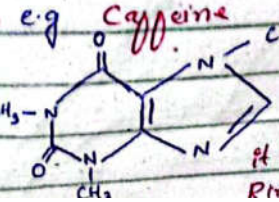

Overall it is purine Ring.

* Ephedrine made from • Tyrosine
• Phenylalanine

* Purine :-
• In tea Purine → (convert into) Xanthine → Caffeine.
• In Our Body Purine → Nitrogenous Bases → Nucleocides

Chemical Classification of Alkaloids

1) Pyridine - Piperidine Alkaloids :-
• Areca nut
• Lobella
2) Tropane Alkaloids :-
• Belladona
• Stramonium
• Hyoscymus
3) Quinoline Alkaloids :-
• Cinchona
4) Isoquinoline Alkaloids :-
• Ipecac
• Opium
5) Indole Alkaloids :-
• Rauwolfia
• Catharanthus
• Nux-vomica
• Physostigma (Not imp)
• Ergot
6) Imidazole Alkaloids :-
• Pilocarpus
7) Steroidal Alkaloids :-
• Veratrum
8) Alkaloidal Amines
• Ephedra
• Colchicum
9) Purine Bases :-
• Tea
• Coffee

Properties of Alkaloids

1) Mostly they are crystalline solids and very few are liquid in nature

- Nicotine
- Coniine

* اگر alkaloid have no oxygen in there structure then it is liquid

2) They are white / colorless. May be coloured.

- Nicotine → Yellow
- Berbarine → Yellow
- Salts of Sanguinarine → Red

3) Alkaloids exist in 02 form :-

i) Free Base → i.e Ephedrine
ii) Salt → i.e Ephedrine Salt (Ephedrine Hydrochloride)

How Alkaloid Salt Are Formed?

Alkaloids + Acid → Salt

Why Read with Acid :- Because alkaloids are basic so react it with Acid to form salt.

Free Base	Salt (Alkaloidal Salt)
• Sparingly soluble in water	• Freely soluble
• e.g Ephedrine	• e.g Ephedrine Hydrochloride

Due to their solubility (Free Base and Salt) are used as base for alkaloidal extraction from plant.

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Extraction of Alkaloids

Process – A :- For those which contain alkaloid in the form of salt

Powdered material
↓
Moisten with water
↓
Addition of lime
↓ → Alkaloids → Filter
Addition of Organic solvent
↓
Addition of Aqueous Acid

Process – B :-

Powdered material
↓
Addition of water and Aqueous Acid Or
Alcohol and Aqueous Acid.
↓
Addition of organic solvent
↓
Addition of excessive sodium bicarbonate / Ammonium
↓
Filteration or extraction with organic solvent.

1) **Process – A :-** For those plant which contain alkaloids in the form of salt.

* **Moisten with water :-** Alkaloid will come from powder to water, Extraction occur.

* **Addition of lime :-**
(Calcium carbonate)
It is Basic in nature

Suppose $CaCO_3 . (H_2O) \longrightarrow Ca(OH)_2$ + Morphine sulphate

- Salt will be break and morphine will Separated. in free base. and free base is insoluble in water so it will precipitate out.

2. Polar impurities Remain in water
   - Acids, Tanins

* Addition of Organic Solvent :-
  - Ether
  - Hexane
  - Chloroform
  - Benzene etc

- It dissolve the alkaloids by shaking the mixture

* Addition of Aqueous Acid :-
  - Dilute HCl etc.

- If Organic solvent added mix with water containing Acid, they are immiscible and → will not mix
  → Salt will form and will go to the aqueous layer from organic solvent
  * Non polar impurities separated

How to separate Organic and Aqueous layer?

them in another bottle

2. Process - B :- Done for those alkaloids present in plan which are in free form. (Free base).

* Addition of water & Aq. Acid :-
  - Free base will change into salt and salt is soluble in water.

* Addition of Organic Solvent :-
  - Organic solvent not miscible with water
  - Non-polar impurities will be Removed
    - Goes into organic layer

* Addition of Excessive Sodium ~~Bicarbonate~~ carbonate / Ammonium :-
  - Same as $CaCO_3$.
  - Alkaloidal salt will change into free base.

Excessive b/c of :/ Excessive cause :-
- Aqueous Acid neutralize
- Convert it into free base.
- Acidic impurities will also be neutralize.

* Filteration Or Extraction with Organic Solvent :-
  Organic solvent will dissolve the free base of alkaloid and make crystal of it.

1) Lobelia :-

Synonym :- Indian tobacco

B.O :- Lobelia inflata

Family :- Campanulaceae

Part used :- leaves and Arial portion

Indeginous to :- South East Asia, US and Canada.

Chemical Constituents :- Alkaloids (0.24 — 4%)

According to BP Standard lobelia have not less than 0.25% of alkaloids calculated as Lobeline. (Major Alkaloid)

Also Present;

- Lobelanine
- Isolobelanine
- Lobelanidine.

Mechanisim :-

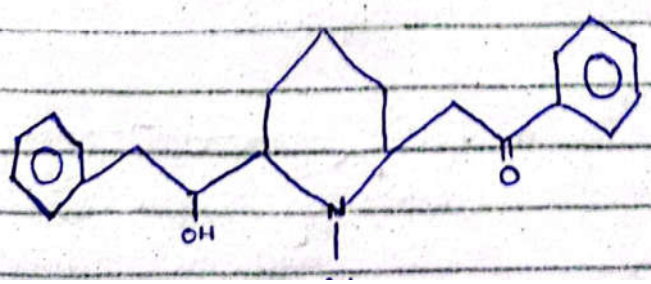
It is partial agonist of Nicotinic (R). It inhibits Reuptake of Dopamine and Serotonine. Pshycoactive effect of lobeline are comparable but of weaker intensity w.r.t Nicoline.

Use :-

1) To avoid smoking → Smoking cessation

2) Spasmotic Asthma

↳ Lobeline is smooth muscle Relaxer



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2) Areca Nut :- (یہ viva میں بھی آتا ہے)

Synonym :- Betel nut

پتا → (پان) ... لیکن Areca پان نہیں ہے۔
Areca nut وہ سپاری ہے جو پان میں ڈالتے ہیں۔

Betel leave — پان
Betel Nut — سپاری

B.O :- Areca catechu

Family :- Palmae

Part used :- Dried seeds

Indeginous to :- South east Asia (برِاعظم ایشیا)
↳ India, Pakistan etc.

Only misuse of Areca nut done in this subcontinent.

It is neglected public heath emergency of our region.

Chemical Constituents :- * Alkaloids (0.1 — 0.5%)

- Arecoline
- Arecaidine
- Guacine
- Guvacoline

* Tannins (جو منہ کو سرخ کر دیتا ہے) (viva
Phlobaphenes

* Fats (Fats میں آتا ہے)
Esters of lauric acid, myristic acid and oleic Acid

Pharmacology & Health Concerns :- Arecanut is mainly chewed. So persistant uses is able to cause Oral submucosal fibrosis (A free malignant lesion)
Able to convert into cancer.

Why People takes it?

It increase slightly level of Alertness.

And a very mild sense of Euphoria

False sense of happiness.

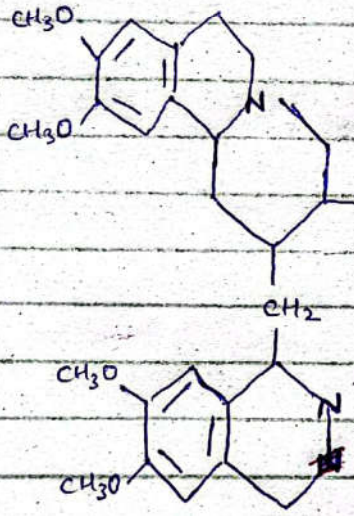
(Arecoline)

* Structure وغیرہ Viva میں پوچھے جائیں گے۔

3) Ipecac :-

Synonym :- Brazilian ipecac / Rio ipecac.
B.O :- Cephaelis ipecacuanha
Family :- Rubiaceae
Part used :- Roots and Rhizome.

Chemical Constituents :- Isoquinoline alkaloids
Standard :- The plant (Root) should contain not less than 2% of Ether soluble alkaloids
* Alkaloids calculated as
- Emetine
- Emetamine
- Cephaline [stronger emetic than]
- Psychotrine
- ——— methyl ether



(Emetine)

Also present :-
Ipecacuanhic acid
Ipecacuanhin

Use :-
1) Emetic ⇝ Ipecac syrup [Use in General poisoning]

Basic Mechanisim / Pharmacology :-
Centerally :- It stimulates the CTZ
Peripherally :- It is Gastro intestinal irritant. They sensitize the nerve ending of Gastric mucosa.
2) Emetine has anti-paristic activity (Anti-protozoa) specially in Amebbic Dysentry.

3) Expectorant ⇝ Productive cough expulsion

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4) Ergot :- (very important ✓✓)

Basically it is fungal infection & effect wheat, Rice, maize, Rye.

Synonym :- Ergot of Rye

Ergot :- Ergot is the dried sclerotium of ;

B.O :- Claviceps purpurea

Family :- Clavicepta ceae

which growns in the ovary of Rye

B.O :- Secale cereale

Family :- Gramineae.

Part used :- Dried sclerotium

Basically Ergot infect the Grain. So we do controlled cultivation of fungus on the crops.

It is dme in Austria, Hungari, Denmark etc.

Life cycle

Spores (Ascospores) introduced onto the plants.

↓

Spores travelled to ovary.

↓

And Grow in ovary. called Hyphae (Growed Structure)

when hyphae starts to grow its color is white.

and this stage is known is Sphacelia.

↓

As the time posses by Hyphaes start to penetrate into walls of ovary to get their nutrition from Xylem and Phloem.

↓

Hyphae also release some secretion (yellow) due to which Hyphae color converted into Yellow

• Bread affected by Ergot may cause Hallucination if eat.

These secretions are beautiful and attract insect to transfer it to other plants.

↓

During Honeydew the Hyphae almost penetrated into the walls of ovary. This is the time of collection.

Sclerotium:-

In Honeydew stage the ovary included the fungus penetrated into walls of ovary.

↓

After Honeydew, Hyphae produce spores called conidi spores. The insect took away the spores to land or bread etc.

↓

These spores grow and produce → Hyphaes which produce. spores called Ascospore.

Conidiospores :- Grow in side of ovary

Chemical constituents:- Indole Alkaloids

Ergot contains not less than 0.15% of Alkaloids calculated as Ergotoxine.

Alkaloids Are:- • Ergotamine (Tab) → Present in market
• Ergometrine (inj)
• Ergocristine
• Ergocristinine.
• Ergocryptine
• Ergocryptinine
• Ergonovine

Use :-1) Effective in classical migraine attack (Ergotamine)
Product = Cafergot

2) Ergometrine increases uterine contraction, helps in Birth, induce labor / uterine contraction.
• Misuse in Abortion.

3) • Afterbirth bleeding is stoped by Ergometrine b/c it is vasoconstricter → [Postpartum Hemorrhage

Mis-use :-

1) If bread affected by Ergot is eat, it will cause Hallucination

2) It is one of the most active psychotomimetic drug (LSD → Lysergic acid Diethyl amide)

Party drug used in advanced countries. b/c it end up all inhibition.

3) Use for Abortion.

- Mimics the symptoms of psychosis, including delusion or delirium as opposed to only Hallucination.
- Delusion :- فريب
- Delirium :- Serious disturbance in mental abilities that results in confused thinking and reduced awareness of environment.

5) Physostigma :-

• ایک بہت سخت زہریلا۔ افریقہ والے جرم کو یہ کھوتے تھے اگر وہ مرجاتا تو وہ گنہگار اگر زندہ بچ جاتا تو وہ گنہگار نہیں۔

وہ جگہ جہاں یہ ہوتے ہیں

Synonym :- Calabar beans, Ordeal beans.

B.O :- Physostigma venenosum

Family :- Legumineae

Indeginous : Western Africa

Part Used :- Dried ripe seeds

Chemical Consituents :- Indole alkaloids (1%)

White, Photosensitive
If it expose to light
it changes into
rubreserine
(Red in colour)

- Physostigmine / Eserine (0.15%)
- Iso — —
- Physovenine
- Geneserine
- Calabacine
- Calabaline

Pharmacology :- Indirectly acting cholinergic Reversible AchE inhibitor.

- Constrict pupil
- Constrict bronchiole
- Yes HR
- Dilate Blood vessel
- Yes salivation.

Uses :-

1. It is Miotic

- Outflow of aqueous humor is enhanced by Miotic through Shlemm Canal. So IOP reduced. and it effective in Glaucoma.
(یہ بڑی بات لکھنی ہے یہیں)

2. Use in Anti-cholinergic poisoning
3. Myasthenia Gravis (Slightly)
4. Enhance ~~Delay~~ Gastric Emptying.
   Delay Gastric — time.
5. Somewhat effective in Alzheimer's Disease.

- Now Gallantamine And Donepezil used.

in This disease.

- So the drug ↑ ACh. And the cognitive function enhanced.

6) Pilocarpus :-

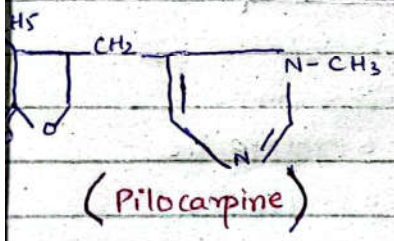
Synonym :- Jaborandi leaf

B.O :- Pilocarpus microphyllus.
Pilocarpus jaborandi

Family :- Rutaceae

Part :- Dried leaves.

Chemical Constituents :- * Imidazole Alkaloid (0.7—0.8%)



(Pilocarpine)

- Pilocarpine
- Iso- ——
- Pilosine
- Iso- ——

* Volatile Oils (0.5%)

- Monoterpenes
  ↳ Limonene
- Sesquiterpenes
  ↳ Caryophyllene

Pharmacology :- Directly Acting Cholinergic Parasympathomimetic

Directly bind to (R) and agonise it

Use :-

1. Miotic (ঠোপা)
2. Enhance Gastric emptying - Use in constipation.
   ↓ called
   Prokinetic Agent.
3. Enhance urinary secretion. • Use in Atonic Blood
4. Oral xerosis (Dryness) • Postoperative urinary Retention.

جب Album کسی بھی نام میں آجائے تو اس کا Flower سفید رنگ کا ہوگا۔

7) Veratrum :-

Synonym :- Helleborе

B.O :- Veratrum viride (American) → Green Hellbore (Common Name)

Veratrum album (Europen) → White —

Family :- Liliaceae

Part used :- Roots and Rhizome

Chemical Constituents :- Steroidal alkaloid

More than 100 are separated

Broadly steroidal alkaloids classified into

1. Jervatrum (A)
   - ↳ Pseudojervine
   - ↳ Veratrosine
2. Cevevatrum (A)
   - ↳ Germine
   - ↳ Protoverine
   - ↳ Veracevine

Uses :-

1. Veratrum was used as insecticides (Historically)
2. It is hypotensive (↓ B.P) → Cevaratrum (A) are more effective in lowering B.P

- سیلبس کے لحاظ سے imp ہیں مگر MCQs میں آتے ہیں۔
- European اور American نام آ سکتے ہیں۔

8) Colchicum :-

Synonym :- OS کے Tests اور Papers میں important ہے۔
Very important ہے۔ ... میں آتا ہے۔
Autumn crocus
Meadow Saffron

B.O :- Colchicum autumnale

Family :- Liliaceae

Part used :- Dried seed and corm
- underground stem
- Stored food

Chemical Constituent :- Alkaloidal Amines
- Colchicine → Not a true alkaloid. It is protoalkaloid
  - یہ وہ ہے Ring N میں ہوتا
  - They are derived from Amino acid.

* Colchicine — When exposed to light it produces
Originally its color deep yellow colour alkaloids
is yellow whitish.

Use :-

1. Gout treatment
   - Accumulation of uric acid in joints
   - When it is more in blood, its extra amount ppt out and in soft corner of body (Joints etc) The accumulation of uric acid occur and WBC etc come to that site
   - Colchicum has minimal effect on uric acid conc.
   - It is Anti-inflammatory and it reduces Neutrophils

Anti-Mitotic :-

Those drug which effect any stage from pro-phase ⟶ Telophase

2. Familial Mediterranean Fever

↓

Lebia, Egypt, Palastine, Israel, Sena

- Multiple organ inflammation occur.
- Cholchicine is anti-inflammatory

3. It is Anti-cancer.

↓

i- Colchicine Binds tubuline

↓

ii- Inhibits formation of microtubule assembly

↓

Imp for cell growth.

iii- Colchicine inhibits chromosomal segregation and it effects metaphase

↓

Self pro-liferation

4. Use in Plant breeding to induce Polyploidy.

↓

- Change in no. of chromosome from the original one.

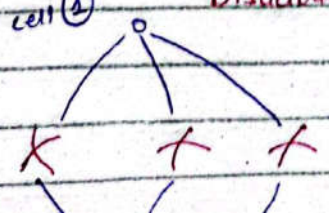
Humans & Animals :- Life threatening

Plants :- They survive

- Whenever chromosome no. changes in plants so the seed of that changed plant can't grow its offspring.

Advantages :- They cannot spread (Self-propagation not occur)

Disadvantages :- دوبارہ بیج نہیں بنے گا



- اگر cell ④ زیادہ زور لگائے تو وہ chromosome کو اپنی طرف کھینچ لے گا

Synonym :- Black tea, Chai, Green tea

Both from same plant

B.O :- Camellia sinensis (New Name)

Thea sinensis (Old Name)

Family :- Theaceae

Part used :- Dried leaves

Processing of Black Tea :-

1. Collection
2. Withering
3. Rolling
4. Fermentation
5. Drying
6. Sieving

1. Collection :-

Leaves and buds are collected

2. Withering :- (सुखाना)

- Leaves are spred into trays / Grounds and placed in sun or near fan and or placed in ventilator

Purpose :- To speed up the water loss and ↓ wt. and done for many hours

- The cloth are placed on the tray to place the leaves on tray.
- At the end of withering (after 15-16 hrs) around 30 % moisture lose

3. Rolling :-

The withered tea leaves are placed in Roller plates for 30 min to bring about leaves Rolling.

After Rolling leaves are broken.

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All water are not removed till fermentation.

4. Fermentation:- (at 40°c for few hours).

- Black tea is black b/c of fermentation / Oxidation.
- — — — also example of curing

Due to water presence, enzymatic activity starts and colour changes from

Green → Red → Black

5. Drying:-

(at 80-90°c for 20 min).

Colour will be black.

6. Sieving:- (Big)

Complete Grain, Unbroken leaf → Good Quality of tea.

* Processing of Green Tea:-

The first 03 steps are same.

1. Collection
2. Withering
3. Steaming / Drying → More than 100°c required, Brittle leaves
4. ~~Dry~~ Rolling → Easy b/c of brittle leaves.
5. Drying More than 100°c required.

اتنا خشک کرے کہ آخر میں چائے میں پانی کی مقدار 5٪ تک رہ جائے۔
اس لیے دوبارہ Drying کیا جاتا ہے۔

How Moisture Calculated?

- By weight.
- Subtract the product weight from the reactant and derive the %.

Chemical Constituents:- Purine Alkaloids

- They are pseudoalkaloids b/c
- They are not synthesized from Amino Acid. but Nitrogen is part of HC Ring.

caffeine, Theobromin, Theophylline ⟶ Methylxanthine (Bronchodilator)

- Alkaloids :- Purine Alkaloids
- Tannins :- Caffeine (1-5 %.) Tannins (10-24 %.)
- Volatile Oil :- Small Quantity
- Theobromine and Theophylline are also present.

- All the tea properties is b/c of Tannins
  - Colour
  - Flavenolds

Mechanisim:-

- Caffeine is stimulant (CNS) and it is b/c of — Adenosin (R) Antagonist
  Adenosine ∝ Drowsiness
- Caffeine and Theophylline
  (Bronchodilator) (Bronchodilator)
  They cause Bronchodilation through inhibition of PDE (Phosphodiesterase.)
  Work on cAMP and tes it.

Uses :-

1. Alertness
2. Improves cognition
3. Asthma
4. Neonatal Apnea b/c of Theophylline
5. B/c of tannins and Flavenolds Tea has strong Anti-oxidant Activity.

* Biggest exporter of coffee Brazil (40%)

10. Coffee :-

Synonym :- Arabian coffee, Coffee beans
Roasted coffee.

B.O :- Coffea arabica
Coffea liberica

Family :- Rubiaceae

Part used :- Dried seed / beans.

Indeginous to :- Ethopia, Sodan, Egypt, شام, عراق, فلسطین NORTH AFRICA

Processing of coffee :-

1. Collection of fruit :-

(Fully Ripened Not کچا)

2. Drying :-

i- Fruits are spread evenly on porous tables.

تاکہ ہر طرف سے ہوا آئے

ii- Then air is blown through dried fruits in all direction, so it is evenly dry.

iii- This process done for 15-20 days.

iv- This Results 30-35 % wt. loss

v- After this step seeds are separated from fruit.

3. Roasting :-

i- Most technical step.

ii- At temp. of about 200°C.

iii- Since seeds are hard so باہر سے جل نہ جائے
(Technical Step) اور اندر جل نہ جائے.

iv- Duration of heat is variable and it is based on experience.

v- No overheating
When core of seed receive sufficently heat you must low the temp. (Experience Step)

vi- During Roasting
Colour, Odor, Taste changes (Physical)

and chemical changes also occur.

- Roasted beans — Original / Natural beans
  Black or Dark brown — Green color
- Coffee is biller in taste.
- Before roasting the seeds have slightly sweet taste
- Coffee smell ·ಮಿಠಾಯಿ ವಾಸನೆ ಬರುತ್ತೆ.

* If someone is sweet it must have simple small sugar and Natural coffee also have sugar but Roasted coffee haven't b/c when it heated the sugar broken down and caramalization of sugar occur.
  - Color changes
  - Smell changes

Chemical Constituents :-

Green Coffee Bean	Roasted Coffe Bean
• Volatile Oil present	• V.O present but composition is different
	• ↑ Caffeole
	• ಮಿಠಾಯಿ ವಾಸನೆ ಬರುತ್ತೆ Coffee
• Acids (weak)	• Acids

- In coffee tannins are also present
- — — Weak acids - — —
- Caffeine conc. are independent of Roasting

* In coffee the Following Alkaloids Present :
  i- Caffeine (1-2%)
  ii- Theobromine
  iii- Theophyline

Pharmacology :-
Same as tea.

Uses :-

Panadol Extra = 65 mg caffeine.

Caffeine is greater in cup of coffee than in cup of tea. چائے کے کپ سے کافی کے کپ میں کیفین زیادہ ہوتی ہے۔

Coffee cup = 100 - 200 mg caffeine.

کافی کے کپ میں 100 سے 200 ملی گرام کیفین ہوتی ہے۔

Black tea cup = 60 - 100 mg caffeine

Green Tea cup = 20 - 60 mg caffeine

Tropane alkaloid = (3)

Indole alkaloid = (3)

Opium, Cinchona, Ephedra

→ 2nd year.

Tropane Alkaloids.

1. Belladona	2. Stramonium	3. Hyoscyamus
Synonym:- Deadly night	Thornapple, Jimsonweed, Jamestown's weed	Henbane
B.O:- Atropa belladona	Datura stramonium	Hyoscyamus niger
PU:- Leaves & Flowering tops	Leaves & Flowering tops	Leaves & Flowering tops
Family:- Solanaceae	—	—
Standard:- Belladona	—	—
B.P contain alkaloids not less than 0.3% calculated as Hyoscyamine	not less than 0.25%	not less than 0.05%
C. Constituents:-		
* Alkaloids (Tropane alkaloids)	*	
1. Atropine ↑	1. —	1. —
2. l-Hyoscyamine	2. l- — ↑	2. —
3. Hyoscine OR Scopalamine	3. —	3. — ↑

- Belladona Means :- (بيلادونا) Because Atropine dilate the Eye and make it bigger.

- Atropine is mixture of Dextro and Levorotatory Hyoscyamine.

Pharmacological Effect :-

Levorotatory > Dextrorotatory

- Structure of Atropine & Hyoscyamine structurally and Atropine Racemic mixture of

Uses :-

1. Mydriatic in nature, cause dilation of eye & chemical use is in opthalmic examination.
2. Anti-cholinergic
   i- Anti-spasmotic
      Hyoscine ⟶ کہتے ہیں Bascopane جسکو کہتے ہیں
   ii- Motion sickness
      (Hyoscine is better)
   iii- Anti-diarrheal (Non-injectious)
   iv- Cholinergic toxicity
      In organophosphate poisoning as Anti-dot.
   v- Bronchodilators
   vi- Anti-ulcers
   vii- Nocturnal enuresis
      بچے جب راتوں کو بستر گیلا کرتے ہیں۔
      بڑے بوڑھوں میں بھی ہوتا ہے۔
      Adults : Benign Prostate Hypertrophy.
      Childs : Urinary incontinence
   viii- Parkinson disease
      (Yes the Acetylcholine)
      Normally there is balance b/w Dopamine and Ach. In parkinson disease, Dopamine conc. ↓. So Anti-cholinergic Drugs also Yes the Ach to make balance.

Indole Alkaloids

14. Rauwolfia :-

Synonym :- Snake root, Sarpagandha
Pagal ki dawa, Chota chand
سانپ کے بچے ہیں

B. Name :- Rauwolfia serpentina
Part used :- Dried leaves
Family :- Apocynaceae

C. Constituents :- Alkaloids (indole) [0.7 – 2.4%]

Discovered in 1952.

* Anti-Hypertensive ← Reserpine
* Use in mode disorders
  - Shizophrenia
  - Bipolar disease

Reserpine
Reserpidine
Recinamine
Serpentine
Serpentinine
Ajmaline
Ajmalicine
Ajmalinine

- Anti-Arrhythmic
- Discovered in 1931

ڈاکٹر سلیم الزمان صدیقی نے اس کو
discover کیا تھا کراچی یونیورسٹی۔
اور اجمل کے نام سے موسوم کیا۔
اجمل بیمار تھا بائی تھا۔

15. Nux-Vomica

Synonym :- كُچلہ (کچلہ)
Dog buttons, Dog poisons.

B. Name :- Strychnos nux-vomia

Family :- Loganiaceae

Part used :- Dried Seeds

C. Constituents :- Indole alkaloids (1.8 — 5.3%)

- Strychnine (Stimulant)
- Brucine

Use :-

1. Rodenticides kills Rate and mices
2. It was used as Tonic & Stomachic (معدہ)
3. Circulatory, Respiratory Stimulant

* If a person die to strychnine overdose his back will be arch shape
It is called Opesthotonic contraction.
* Strychnine is irreversible inhibitor of glycine.

* Both alkaloids are Neurotoxic in nature
↓
cause peripheral neuropathy.

Vincristine toxicity > Vinblastine toxicity

6. Catharanthus :-

Synonym :- Sada bahar (سدا بہار)
Vinca rosea (وِنکا روزیا)
Periwinkle
(Madagascar) periwinkle.
↑ Indigenous to

B.O :- Catharanthus roseus
Family :- Apocynaceae
Part used :- Dried leaf, flower or whole plant.

C. Constituents :- Indole alkaloids
(More than 150 alkaloid are isolated)

Famous Dimeric Indole Alkaloids
↓ ↓
Vincristine (less) Vinblastine (more)
(0.0002%) (0.005%)
• Ajmalicine
• Serpentine

Made up of 02 units :-
1. Catharanthine
2. Vendoline

Why Catharanthus is so famous ?
1. Catharanthus is present in pakistan
2. Vincristine and vinblastine are in practice
3. Very less amount of alkaloids present so to produce it synthetically
4. Dr. Atta ur Rahman synthesize vincristine in lab.

Uses :- Both are anti-cancer, anti-tumor, Anti-neoplastic
↓
• Hodgkin's lymphnea
• Non- " "

17. Opium Poppy

Synonyms :- Dodaq (پوست)
پوست انبون (اردو)
Poppy capsules
Indian opium

Botanical Name :- Papaver somniferum
Family :- Papaveraceae
Part used :- Dried unripened poppy capsules.

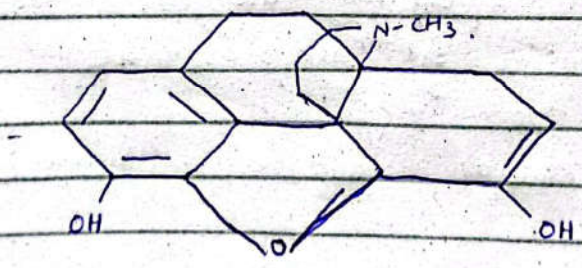
* Opium is dry latex obtained from poppy capsules by making longitudinal incision / cut
  - But the incision will not deep too much
    - in day time & they dry in night.
    - and in the early morning they are collected.

Some transverse incision also occur by Turkey.

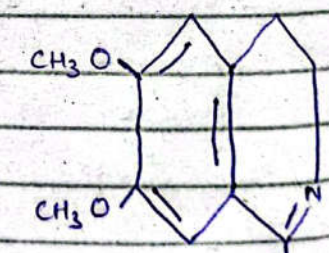
* Opium in indeginous to Afghanistan, Pakistan, India, turkey

Chemical constituents :- Alkaloid (9-12 %.)
  - About 30 are present
  - Divided in 02 classes.

Morphine., Codeine, Noscopine, Narceine, Thebaine ← Phenanthrene (A)
Papaverine. ← Benzyl isoquinoline

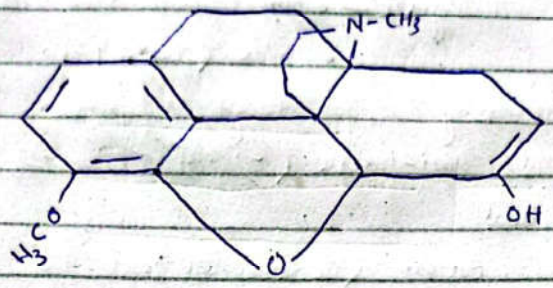


(Morphine)



(Papaverine)

* Codeine is methyl morphine



(Codeine)

* Opium latex has alkaloid

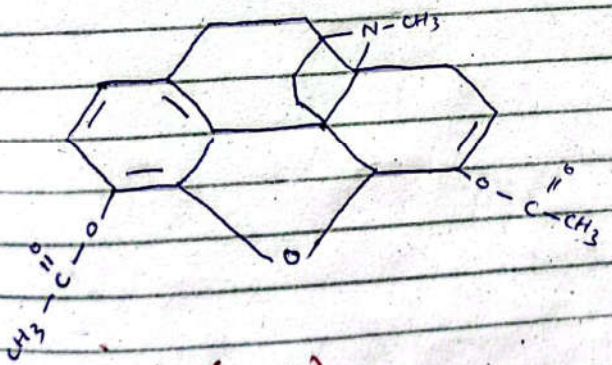
* Powder (پاؤڈر) produced from morphine
  ↓
  Heroin

Why Heroin Produced? To get up off from aches
درد سے آرام کے لیے

* Morphine is best pain killer (Analgesic) and Heroin is better than morphine.
  - Less additive
  - More addictive.

* Morphine (inj) is only available at certain Govt. Hospital.

What is Heroin?
It is Diacetyl Morphine (By Acetylation)



* Occur by R–X

$CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

(Acetic anhydride)

(Heroin)

Semi-synthetic Derivative :-
of Codeine :- Phlocodeine
of Morphine :- Pentazocine (inj)
Dextromethorphan.

Uses :-

1. Narcotics Analgesic → • For cancer chemotheraphy
   • Colic (severe pain of kidney)
2. Codein is very good cough suppressor
   Codeine is Anti-tussive (কাশি দমনকারী ঔষধ।)
3. Anti-diarrheal
   ↳ Cap. immodian (loperamide)
   use in non-infectious diarrhea.
4. Miotic keep pupil dilator
5. Papaverine is smooth muscle relaxer of Blood vessel (localized vasodilator).
   ↳ Use in male Erectile dysfunction.

18. Ephedra

Synonym :- Ma Huang (Chinese)

B.O :- Ephedra sinica → Chinese specie

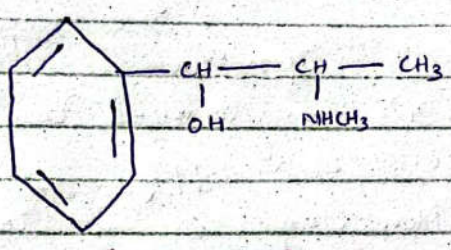
Ephedra gerardiana
Ephedra nebroidensis → Pak specie

Family :- Ephedraceae
Gentaceae (Old Name)

Part used :- Dried shoots and stems.

Chemical Constituents :- Alkaloid (0.5 – 2%)

1) In stem → • Ephedrine (30–90%)
• Pseudoephedrine (Stereoisomer of Ephedrine)



(Ephedrine)

N is outside of Ring in Ephedrine so it is not true alkaloid and it is phenyl alkyl amine class of alkaloid.
↓
N- present inside ring

2) In Roots → Certain complex compounds present called Ephedradine

Use :-

1. Ephedrine is directly and indirectly acting (Mixed) Non-selective Adrenergic Agonist / Sympathomimetic
Directly Acting Adrenergic Agonist :- Directly act on (R)
Indirectly — — — :- Act through Epinephrine and N.E from the Adrenal medulla.

Sympathetic N.S :- More N.E
Adrenal Medulla :- More Epinephrine.

Non-Selective Means :- All the α and β.
Beta-II (R) present in lungs.

2. When Ephedrine act on β-II (R) it activate β-II (R)
↓
Cause smooth muscle Relaxation
↓
Result Bronchodilation
So Ephedrine use in :- Asthma, Allergy, Pulmonary Disease.

3. Secondly it is Nasal decongestant
↓
Open the closed Nose.
Mechanism :- ↳ It causes localized vasodilation
↳ More blood supply
↳ More chances of water to ooze out and enters to interstitium

4. Ephedra ↑es Heart Rate
β-I (R)
M_2- Cholinergic (R) } Present on Heart

5. Ephedra causes vasoconstriction
• α-1 (R) present on Blood vessels.

6. Ephedra ↑es sugar level by ↑ Glycogenolysis (Liver effect)
β_2 OR β_3 (R) present on Liver

7. In uterus when β-2 stimulates, it Relaxes smooth muscle so protect from premature Birth.

In PAKISTAN EPHEDRA PRESENT IN BALOCHISTAN.

19. Cinchona :-

Synonym :- Peruvian bark (Name of place), Calisaya bark, Jesalt's bark
Cortex cinchonae.

B.O :- Cinchona ledgeriana
—— succirubra
—— officinalis

Family :- Rubiaceae Part used :- Dried bark
Indegimous To :- Peruvia Andes, South America
Also cultivated in :- Indonesia, Java, India.

Standard :- Cinchona bark shald contain about (6.5%) of total alkaloids (30 — 60%) of which are quinine type alkaloids.

Chemical Constituents :- ★ Alkaloids (6.5%)

★ 35 in No.
1. Quinine 70%
2. Quinidine
3. Cinchonine → More in C. succirubra.
4. Cinchonidine

The alkaloids are present in combination with
1. Quinic Acid
2. Quinovic Acid
3. Cinchotannic Acid (Pholobadannin)
↓ on decomposition
Cinchona Red.

★ Glycoside
↓
Hydrolysis ← Quinovin
1. Quinovic Acid
2. Quinovose
3. Red colouring oxidase
4. Calcium oxalate
5. Starch.

* Cinchocerotin (white crystalline substance)
Present in C. calisaya

* Tschirchin (Green colouring matter)
Present in C. succirubra.

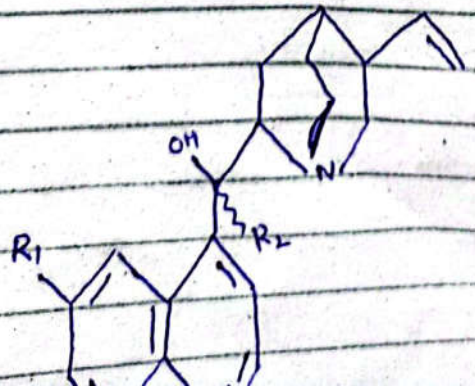
Chemical Tests :-

1) Cinchona + Glacial Acetic Acid → Test tubes
↓
Heated
↓
Blood Red Drops On The side of test tube.

2) Cinchona + Sulphuric Acid → Blue flaoresence in U.V light.

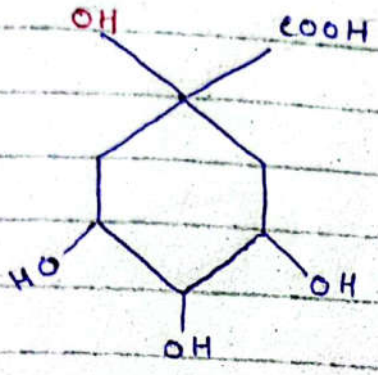
Uses :-

1) Antimalarial
2) Anti-pyretic
3) Analgesic
4) Quinidine is used to treat
   i- Prophylaxis of cardiac arrhythmia
   ii- Atrial fibrillation.
5) Fever
6) Whooping cough.
7) Hay fever
8) Enlargment of spleen.
9) Pneumonia
10) Small pox

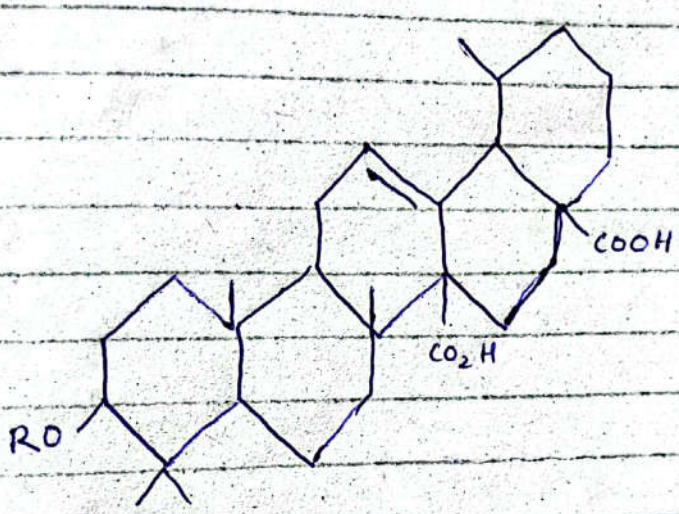


Name	R_1	R_2
Quinine	OCH_3	α-H
Quinidine	OCH_3	β-H
Cinchonidine	H	α-H
Cinchonine	H	β-H

CamScanner

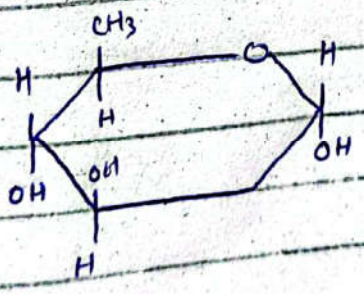


(Quinic Acid)



Quinovic Acid → R = H

Quinovin → R = Quinovose.



Glycosides

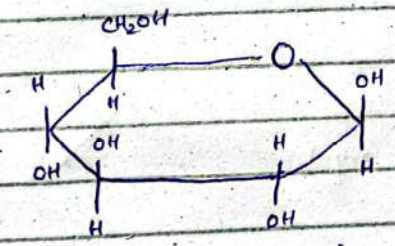
Definition:- Glycosides are secondary metabolites which on hydrolysis yields a sugar portion (Glycone) and a non-sugar portion (Aglycone)

Glycoside
on Hydrolysis it yield

Glycone (Sugar portion)	Aglycone (Non-sugar portion)
• Responsibles for solubility Absorption	• Responsible for pharmacological action.

Naturally the Occur;
Both in 1. Hydrolysed form
2. Intact form.

* In most of cases glycone is β-D Glucose.



(β-D Glucose)

* Some Deoxy Sugar are also in Glycone portion

Rhamnose

Classification of Glycosides

1) Cardioactive Glycosides :-
   i- Digitalis ⟶ (very imp)
   ii- Strophanthus
   iii- White squill

2. Anthraquinone Glycosides :- (very imp)

i- Senna

ii- Rhubarb

iii- Cascara

iv- Aloe

v- Cochineal

3. Saponin Glycoside :- (very imp)

i- Glycyrhizza.

ii- Sarsaparilla

4. Cyanophore Glycoside :-

i- Wild cherry (some time imp)

5. Isothiocyanate Glycoside :-

i- Black mustard

6. Lactone Glycoside :-

i- Canthanide (very imp)

7. Aldehyde Glycoside :-

i- Vanilla (very imp)

8. Miscellaneous Glycoside :- (Rarely imp)

i- Gentian

ii- Quassia

iii- Dioscorea

CamScanner

Classification On The Basis of Linkage.

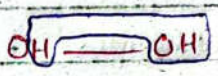
1. O - Glycoside
2. C - Glycoside
3. S - Glycoside
4. N - Glycoside

1. O - Glycoside :-

- When sugar and non-sugar portion attached to oxygen

↓

Both Hydroxyl Group condense
One OH of Sugar portion
One OH of Non-sugar portion.



2. C - Glycoside

- When the carbon group of sugar and ~~non~~ non-sugar portion directly form covelant bond.
- Difficult to Hydrolyze

Example :-

- Anthraquinone Glycoside
- Aloin.

3. S - Glycoside :-

When the sugar and non-sugar portion attached by Sulphur

↓

- Comes from Aglycone portion.
  (like Black mustard)

4. N - Glycoside :-

- Relatively less important pharmacologically.
- When the sugar and non-sugar portion attached by Nitrogen

Nitrogen may come from sugar portion such as

Cyanophore Glycosides

$-NH_2 + OH-$

- Amine may also come from non-sugar portion.

Sugar — N — Non-sugar
        |
        H

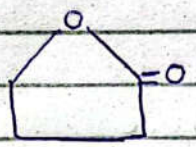
CARDIAC GLYCOSIDE

Aglycone :- Steroid in nature

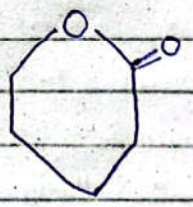
Cardenolides Bufadienolides

- All the steroidal Glycosides have terminal Lactone Ring

5-member → Cardenolides
- Digoxin
- Digitoxin etc.



6-member → Bufadienolides.
- Ouabain



Most of Glycosides Are;
- White Colorless
- Solid

EXCEPT * Anthraquinone Glycosides
↳ They are coloured.

* Some glycosides are toxic → Wild cherry, Apple seed, Peach seed Bitter Almonds.
for protection against Herbivores.

* Glycoside Also Obtained From Animal Source :-
1. Cantharide
2. Cochineal

Cardiac Glycoside Identification Test:-

Keller – Killiani test.

Anthraquinone Glycoside Identification Test:-

Borntrager's test.

Senna

Synonym :- Alexandria senna, Tinnevelly Senna

B.O :- Cassia acutifolia (Africa) Cassia angustifolia (India)

Family :- Leguminosae

Part used :- Dried leaflets and pods

Capsular — Fruit

Indeginous to :- Egypt, Soodan, North Africa, India

Standard :- It contains not less than 2.5% of Anthraquinone glycoside calculated as Sennoside-B

Generally 3-12% of glycoside present

Chemical constituents :- * Glycoside

- Sennoside A
- —— B

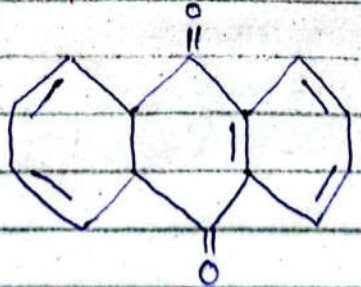
} More in No.

- —— C
- —— D

} Less " "

* Flavenoids
  - Kaempferol
* Mucilage
* Calcium oxalate

* Sennoside A & B $\xrightarrow{\text{Hydrolyze}}$ 3 Glucose + Semidin A & B



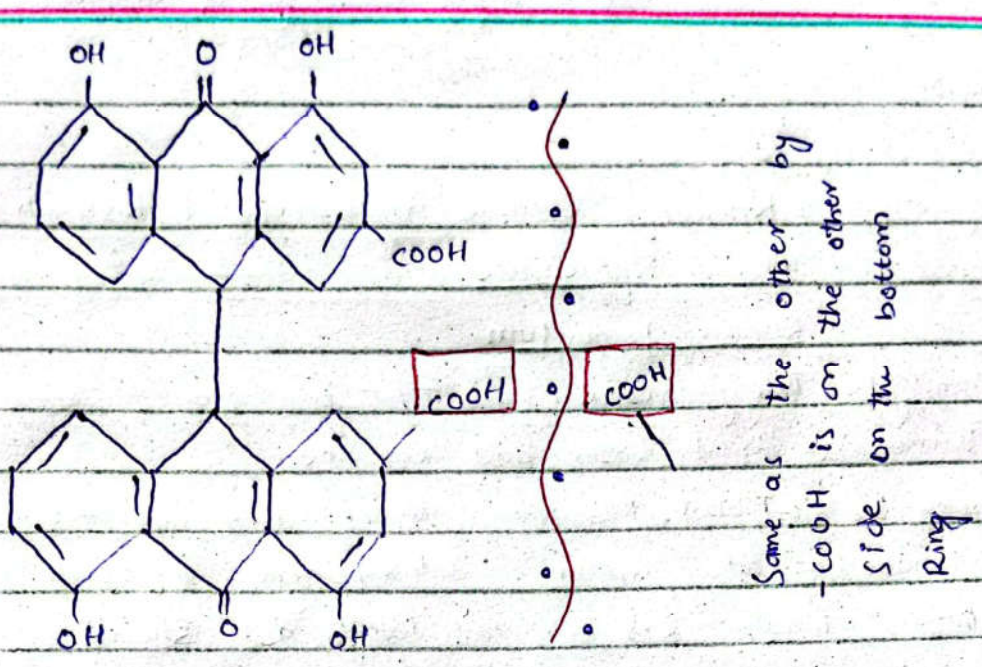
(Semidin) (Anthraquinone)

2- Benzen Ring :- Napthalene

3- " " :- Anthracene

Anthraquinone :- Group of Keto جب دونوں طرف ہو تا ہے Attach

* Senna Glycoside are not irritant in nature.



Sennidin A

- Dextrorotatory

Sennidin B

- Optically inactive.

Because half molecule are the mirror image of each other so they balance their optial rotation.

Use:-

1. Stimulant
2. Purgative
3. Laxative
4. Irritable Bowl syndrom (Constipation)
   [Pshycological disorder]

Senokot :- Drug to be used.

Condition in which Senna used as Laxative

1. Hemorrhoids
2. Rectal Surgery

In case of

Rhubarb is Astringent in nature
↓
Due to high quantity of tannins

(46

Rhubarb :-

Synonym :- Rheum, Chinese rhubard, Turkish rhubard

B.O :- Rheum officinale
Rheum palmatum

Family :- Polygonaceae

Part used :- Dried Roots and Rhizome

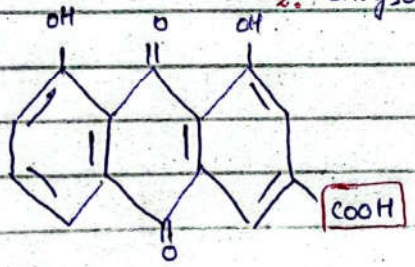
Indeginous to :- Tibbat, Mountainy Areas, China mountains

Standard :- It contain Anthraquinone Glycoside not less than 2.5 % calculated as Rhein.

Chemical constituent :- * Anthraquinone Glycoside (10 %)
present in both forms.

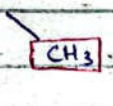
Free form — Bound form

1. Rhein
2. Chrysophanol



(Rhein ⇐ Aglycone portion)

Same as Rhein.



(Chrysophanol)

* Tannins
1. Gallic Acid
2. Catechin.
3. Rheotannic Acid

Use :-
1. Laxative / Purgative
TCM → Tradi Honal chinese medice.
Due to tannin it is used as Healing drug.

CamScanner

Cascara :-

Synonym :- Sacred Barks, Cascara sagrada, Persian bark
B.O :- Rhamnus purshiana.
Family :- Rhamnaceae
Part used :- Dried Bark. (use of 1 year after its collection) (imp) to improve laxative property.
Indeginous To :- Different species are distributed.
Africa, Westindies, Iran, Pakistan.

Chemical Constituent :- * Anthraquinone Glycoside.
- Cascarosides A — D
- Aloin
- Barbaloin
- Emodin
- Aloe Emodin.

Use :- 1. Laxative
2. Purgative
3. Veterinary use (بطور Drug) as laxative.

Aloe :-

[South Africa] [Westindies] [Zanzibar - Africa]

Synonym :- Cape Aloes, Barbados Aloes, Socotrine Aloes

B.O :- Aloe ferox, Aloe barbadensis, Aloe perryi

Family :- Liliaceae.

Part used :- Dried exudate obtained from fleshy leaves

Preparation :- The exudative is boiled with water which solidifies on cooling.

Standard :- It contains anthraquinone Glycosides not less than 28% calculated as; Barbaloin

Chemical Constituents :-
* Anthraquinone Glycoside:
  Aloin 5% in Cape Aloe
  20% in Barbados Aloe
* C-Glycoside
  Barbaloin
* Resin (16-60%)
* Polysaccharides
* Amino Acids
* Vitamin-C, B-Complex
* Minerals such as
  Boron, Phosphorous, Zinic, Ca, K, Si etc

Use :-
1. Laxative / Purgative
2. It is also ingredient of Compound Benzoin tincture → Expectorant
3. Skin disorder / Cosmetics
   → Wounds, Burns, Hair tonic, Edema
   Seborrhea

Cochineal :- (very imp) (viva + MCQ's)

Synonym :- Scale insect
Sessile " (Sessile = motionless)

Zoological Name :- Dactylopius coccus

Family :- Dactylopiidae.

Part used :- Cochineal is dried female insect (viva).

Life cycle :-

These insect reside (stay) all the life on cactus plant

There is difference b/w male and Female insect

Male	Female
1. Can Fly	1. Cannot Fly
2. Small Body size	2. Large Body Size.
3. Small lifespan.	3. Long lifespan
4. Less in No.	4. More in No.

When they grow on cactus

- Female inject the long probscis into cactus for nutrients
- Male Fertilize the Egg

Larvae produce in female body.

- male insect die shortly after fertilization b/c they have weak probosci's.
- Female insect also die when larvae grows.
- During this larvae for protection release waxy material to cover themselves.
- Female insect can also secret the waxy material in her life

In 14 day larvae converted into Pupae.

Total Lifecycle Take 06 weeks.

When they colled at Adult stage

1. Beating the bushes / branches
2. Boiled in water (so they die)
3. Grinding
5. Drying

Why It is Useful?

It has natural colouring matters

* Carminic Acid. (16-24 %)
(Red color)

Chemical Constituent :- Anthraquinone Glycoside
Carminic Acid (16-24 %)

Carmine ⟶ یہ کس طرح بنتی ہے؟ Dye کو

- Precipitation of Carminic Acid with Aluminium salt giving carmine Red.
- Its shade can be violet Or Purple by addition of lime. (calcium salt)

Use :-

Natural colouring Agent
(Foods, Cosmetics).

E120 کو code کہتے ہیں

- If carmine is present in food then childs can't take it

Cantharide :-

Synonym :- Spanish fly
Zoological Name :- Cantharis vesicatoria
Family :- Meloidae
Part used :- Male insect (dried).

Life Cycle :-

1. Female lays Eggs.
2. Male fertilise it.
3. Larvae formed
4. Larvae attached to solitary bee.
5. Solitary bee goes to home/nest with larvae.
6. Larvae feed on the food of solitary bee. If food is not enough then they eat the eggs of bee. So it is b/w Predator and Parasite.
7. When they Adults, they fly

Collection :-

When they are collected at larvae and pupa stage at solitary bee nest.

Chemical Constituents – ~~A~~Lactone Glycoside.

Cantharidin

- Produce by male insect as defensive material
- Also present on its exoskeleton and Release from.
- Irritant, Vesicant, Blistering agent. (Fluid filled swelling)
  Rubifacient.

Uses :-

1. Rubifacient Irritant. Vesicant
2. Aphrodisiac (folk medicine)

Pharmacology :- It causes Inhibition of phosphatase II–A.

acute
It can also cause Tubular Necrosis and Glomerular dysfunction in kidney.

* ڈالرے نوٹ پر Jos washington کی تصویر ہے اس کو Epiglottis کی بیماری تھی اس کو حکیم نے یہ دیا تو اس کا علاج ہو گیا۔

Miscellaneous Glycosides

Dioscorea :-

Synonym :- Wild yam

B.O :- Dioscorea villosa
Dioscorea deltoidea

Family :- Dioscoreaceae

Part used :- Dried Roots and Rhizome

Chemical Constituents :- * Saponin Glycosides

- Dioscin (imp b/c of Diosgenin)

Hydrolyze

Glucose, Rhamnose → Glycone
Diosgenin → Aglycone.

- Hecogenin
- Botagenin

* Alkaloid :- Dioscorine

Use :-

1. Diosgenin obtained from Dioscorea or other species is used as starting material for steroidal drugs. (very imp/viva)
   - (Pregnancy - To stop bleeding) (use in Hormone Replacement therapy) ← Progesterone → Oral - contraceptive.
2. Dioscorea (not wild but (b) used as food material b/c it is sweet Or for the extraction of starch. (چپ قڑی آلو)
3. It is rich is Vitamin - B complex, so it has good nutritional value.

B1 (Thiamine), B2, B3 (Niacin), B6 (Pyridoxin).

Riboflavin

- Poisonous Gention * - * - Taste Viva - Exam *

- Plants 03 important Taste Gention *
Bitter

Gention :-

Synonym :- Yellow gention, Red gention, Bitter root.

B.O :- Gentiang lutea

Family :- Gentianaceae

Part used :- Dried roots and rhizome

Chemical constituents :- * Glycoside

- Bitter Principle
  - Gentiopicrin (2%) → (Aglycone + Glucose portion + Ring)
  - Gentiopicroside.
  - Amaropanin
  - Amaroswerin
  - Gentisin

* Alkaloid :- Gentianine.

Use :-

1. It is used as bitter tone

→ Stomachic

Quassia :-

Synonym :- Bitter wood , Bitter Ash

BO :- Picrasma excelsa

Family :- Simarubaceae.

Part used :- Dried Roots and Rhizome

Chemical Constituents :- Glycoside

- Quassin 0.1 – 0.5 %.
- Neo —
- Hydroxy —
- Scopoletin

Alkaloid :- Cathine 6-one.

Use :-

1. Bitter tonic for stomachic.
2. Insecticide (Natural)
3. Anthelmintic (کیڑے worms کے لیے)
   - For thread worms
   - In the form of Enema administered.

Mustard :-

Synonym :- Black mustard, Red mustard, Sinapis nigra

B.O :- Brassica nigra (Black mustard)

Family :- Brassicaceae

Cruciferae (Old name) b/c of shape of flower which are in cross shape.

Part used. Dried Ripened seeds

Fixed oil

Chemical Constituent :-→ Fixed oil 30-35%

→ Proteins 20%.

→ Isothiocyanate Glycoside

• Sinigrin

* If there is glycoside isothiocyanate or and cyanophore in association must have an Enzyme.

* Glycoside present with the enzyme in same part but in different cell.

* The enzyme associated with the sinigrin glycoside is Myrosin Or Myrosinase.

* There is no reaction b/w Enzyme and this Glycoside. Oils derived by crushing of seed. at this time chemical reaction starts

Myrosin + Sinigrin $\xrightarrow[\text{of sinigrin}]{\text{Hydrolization}}$ Allylisothiocyanate.

$CH_2 = CH - CH_2 - N = C = S$

* Smell of mustard oil is b/c of Allylthiocynate and it is volatile in nature.

• Sinapine

→ Erucic Acid.

Use :- 1) Refined mustard oil → cooking

2) Ghee production by Hydrogenation.

3) It is Rubifacient and counter irritad

↓

Back pain and Back ach

کس بھی تیل سے :

- صابن بناتے ہیں۔
- جس فیکٹری میں گھی بناتے اُس میں صابن بھی بناتے
  اکثر mix بھی ہوتے ہیں۔
- جو صابن بناتے ہیں وہ Glycerine بھی بناتے ہیں۔

- Cyanophore Glycoside are also known as Cyanogenetic Glycoside (Sinigrin)
- Isothiocyanate Glycoside are also known as Glycosindate / Glucosindate (Sa

Wild Cherry

Synonym :- Black cherry, Virginia bark

B.O :- Prunus serotina

Family :- Rosaceae

Part used :- Bark

Indeginous To : Canada, USA (North America)

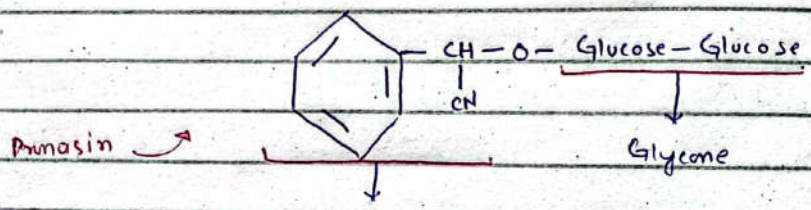
Chemical Constituent :- * Cyanophore Glycoside

Have cyanide

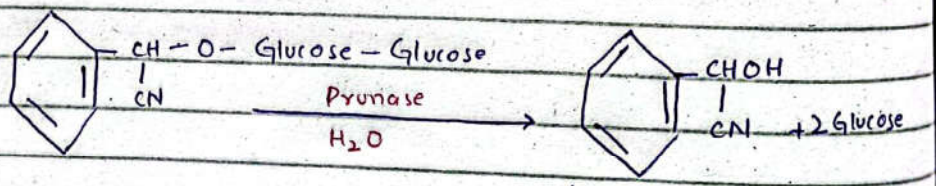
- Prunasin

ప్రూనాసిన్ లో ప్రూనేస్ Enzyme ఉంటుంది కాబట్టి

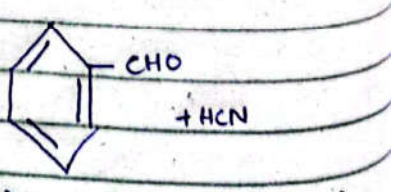
Prunasin have enzyme Prunase.



- This is O-Glycoside.



(Intermediate product)



(Benzaldehyde) (Hydrogen cyanide)

చేదు బాదం నూనె కి ఈ Smell ఉంటుంది

Almond oil also have Benzaldehyde.

Bitter almond are not toxic if not chewed.
If not eat it will not be known that it is pitter.

Uses :-

i- Flavouring Agent
ii- Rubifacient and Counter irritant.
iii- Scabicide → Benzaldehyde lotion and Emulsion

· خارش کی بیماری کے لئے

Semina means seed.

Stropanthus

Synonym :- Semina stropanthi

B.O :- Stropanthus Kombi

Family :- Apocynaceae

Part used :- Dried seeds

Chemical constituents :- * Cardiac glycoside (2-5%)

- Stropanthidin
- * Kombic Acid
- * Choline
- * Trigonelline
- * Mucilage and Resins
- * Fixed oil (30%)

Stropanthidin is cardenolide type of cardiac glycoside

Uses :-

1. It was used as arrow poisoning. (imp)
   شکار کرنے کے لیے اس کے seed میں تیر کو ڈبو کے تیر مارتے
2. It is cardiotonic and diuretic.

Digitalis, Strophanthus = Cardenolides.

White Squill :-

Synonym :- Sea onion
B.O :- Urgenia maritima
Family :- Liliaceae
Part used :- Dried bulb.

Chemical Constituents :- Cardiac glycoside (Bufadienolide)

Scillaro cides

1. Scillaren A
2. " B
3. Glucoscillaren A
4. Proscillaridin
5. Scillicyanoside
6. Scilliazuroside
7. Scillicryptoside

Uses :-

1. Expectorant
2. Cardiotonic
3. Diuretic.
4. Another Variety Red squill → Natural Rodenticide
   Red squill also have cardiac glycoside and death occur due to cardiac arrest.
   Rodents die b/c they haven't CTZ, we dont die b/c of CTZ.

Saponin Glycoside

1. Sarsaparilla :-
2. Glycyrrhiza.

Synonym :-

- When these Glycoside mixed with water → Frothing / lather formation occur.
- Beneficial as well as harmful
  - ↓ ves surface Tension
  - Detergents / Body soaps etc
  - cause hemolysis in higher quantity b/c cell membrane bursts due to disturbace of cell inkegrity.
- More phospholids = More stronger work like as cement works in walls
- Phospholipids imparts strength due to its Hydrophobicity.
- Saponin also present in Animal kingdom.
- Some poison are of saponin nature. as of Amphiblans, Reptiles.

02 - Types of Saponin :-

1. Steroidal Saponins

- Less complex
- Have less No. of carbon.
- Sarsaparill have SS

2. Triterpenoids Saponins (Pentacyclic)

- More complex than Steroidal S.
- Have more Carbon No.
- Glycyrrhiza have TS.

Qualitative Test To Check Saponin :- Mix with water and Shake it.

Lather Formation :- Saponin present

No " " :- No - -

Sarsaparilla :-

Synonym :- Radix sarsaparilla

B-O :- Smilax officinalis
Smilax aristolochiaefolia

Family :- Smilaceae

Part used :- Dried Roots and Rhizome

Chemical Constituents :- Steroidal Saponin Glycoside.

↓

Sarsasapogenin
Parillin
Sarsaponoside
Sarsaparilloside

Use :-

1. Rheumatoid Arthritis
2. Syphillis (Tradional use)
3. Psoriasis (skin disease)
4. Industrial use in the the partial synthesis of steroids.

O- Glycoside.
Aldehyde Glycoside.

Vanilla :-

Synonym :- Vanilla flavour, Vanilla beans.
B.O :- Vanilla planifolia
Vanilla tahitensis
Family :- Orchidaceae
Parts Used :- Pods

Prepared By :- curing

1. Dipping 150 – 170°F for few minutes
2. Sweatening
3. Drying
4. Conditioning
5. Perfectioning

1. Dipping :-

At 150 – 170°F for few minutes in water
B.P of water — 212°F.

2. Sweating :-

wrapped in woolen blanket upto 1 months.

Original Vanilla — Green / Yellow in color
Final Vanilla — Black / Brown in color

At above 02 stages
- Color changes b/c of breaking down of chlorophyll.
- Cellulose is partially broken down — so it become sft
- Glucovanillin → Vanillin + Glucose
  Glucovanillic Acid → Vanillin
  " → Alcohol
- Smell of vanillin starts
- certain Polysaccheride → Simple sugar, so sweet taste starts.
- Enzymatic activity starts such as in above reactions.

3. Drying :-

For 3 – 4 weeks.

- Final moisture content must be 20–30% to continue enzymatic Reaction and shine increase

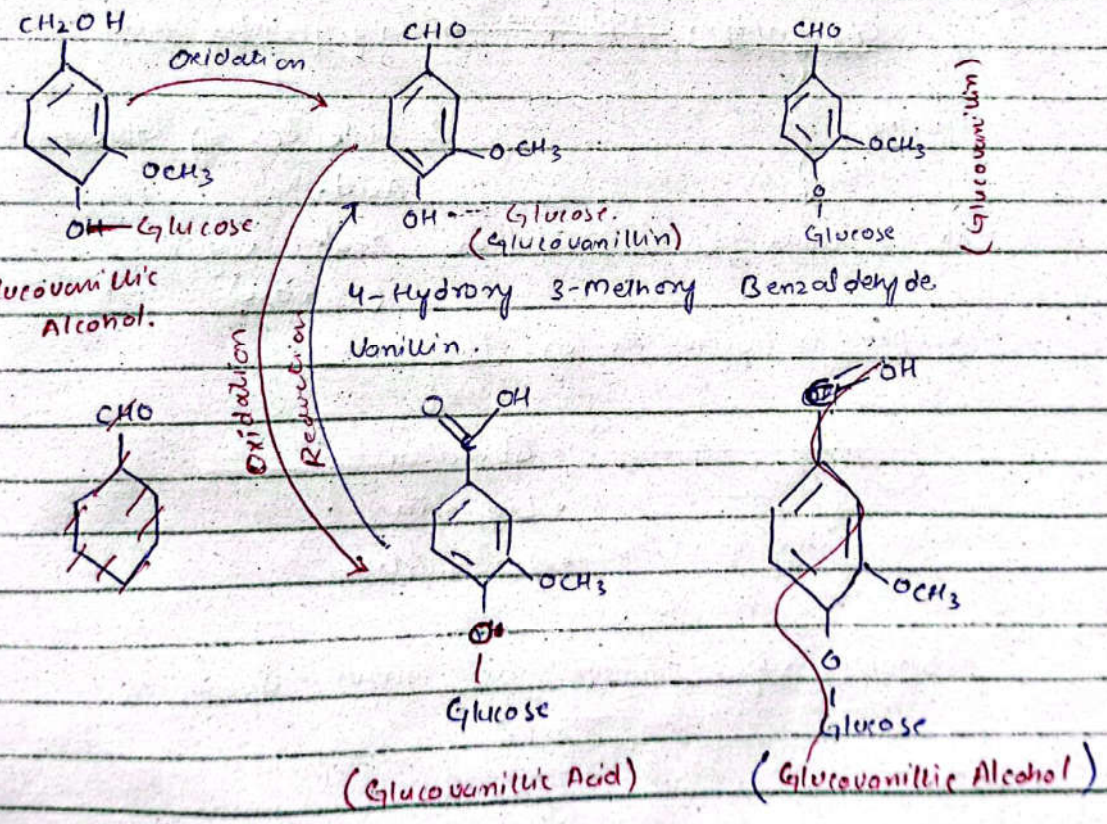
4. Conditioning / Packing :-

- Pods are wrapped in parchment paper/ wax paper & place in box

5. Perfectioning :-

At the end vanilla will black, very shining and have very strong Aroma.

NOTE :- ice cream vanilla, etc are not original it is chemical and original vanilla is Expensive. Vanillin is very easy to synthesize in lab.



Glucovanillin $\xrightarrow{\text{Glucosidase}}$ Glucose + Vanillin.

Vanilla use in;

i- Ice creams

ii- Confectionary

iii- Flavouring agent

Glycyrrhiza

Synonym :- Licorice root, Spanish liquorice
خوردبرگ اُردو۔ملائی

B.O :- Glycyrrhiza glabra
Glycyrrhiza glandulifferae

Family :- Leguminosae

Part used :- Roots Stolon Rhizome

Chemical Constituent :- Glycyrrhizin 6 — 14%.
↓ imparts sweetinsh
(Saponin Glycoside)
- Triterpenoid type of Glycoside
- Pentacyclic.

Glycyrrhizin —Hydrolysis→ Glycyrrhetic Acid
+
2 Molecules of Glucuronic Acid.

- 50 times as sweet as Table sugar (Sucrose)
- Color is yellow b/c of Flavenoids
  - Quercitin
  - Liquiritin
  - Isoliquiritin
- Simple sugar present in minute Quantities

Uses :-

1. Expectorant (بلغم کو نکالتا ہے)
   ↳ Cough Syrup
2. Demulscent
   ↳ Produce soothing effect
   ↳ Effective in dry cough, Sore throat.
3. Laxative
4. Skin lightening (b/c of liquiritin & isoliquiritin)
5. Melasma جلد کی رنگت کا خراب ہونا۔

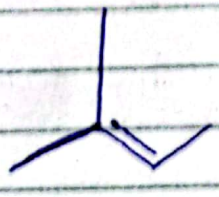
Volatile Oils

- Derivatives of Hydrocarbon, Terpenes which have volatility at room temp / Ambient temp. ——— Volatile Oils
- They are also known as essential oils
  - B/c they have essence (خوشبو)
- They are present in various part of plants such as Blundular Hair, Parenchyma cell, Oil glands, Mesophyll. Sub-epidermal tissue. (Oil glands → Vittae)
- They usually occur in combination with other secondary metabolites such as Gums and Resin
  - Volatile Oil + Resins ⟶ Oleoresins
    - Present in Ginger, Capsicum.
  - V.Oil + Gum + Resins ⟶ Oleogum resin
    - Present in Asafoetida.
- All the volatile oils have similar uses such as they are Condiment, Flavouring Agent, Carminative, Perfumery.

Biosynthesis :- 02 biosynthetic pathway ∴ Oil mades which contain
1. Acetic Acid-Mevalonic acid pathway ∴ Hydrocarbon
2. Shikimic " – Phenyl propanoid " ∴ Aromatic Oil

In Human Pathway No. 1 Block by Statins.

All of the volatile oil made from isoprene unit (5-Carbon)



isopentene / isoprene

Physical Properties Of Volatile

1. They have characteristic odour
2. They have high Refractive indices
3. They are optically active
4. They are lighter than water
5. They are coloured as well as colorless

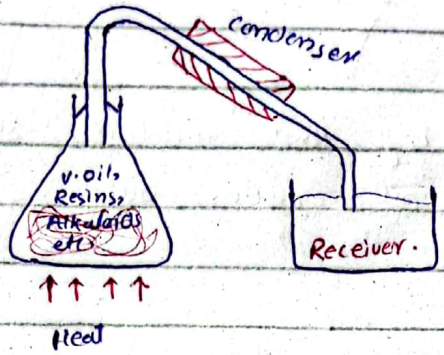
Difference between Fixed And Volatile Oil

Fixed Oils	Volatile Oils.
1) Basic building block is not isoprene	1) Made from basic building block isoprene unit
2) Esters of unsaturated FA with Glycerol	2) Not Esters.
3) Not evaporate	3) Have tendency to evaporate at room Temp.
4) Not	4) Have odour
5) Can be saponified	5) Cannot
6) Have tendency to undergo Rancidity	6) Non rancidity
7) Not used.	7) Use in Aroma theraphy
8) Generally they are found in seed of plant	8) Can be present in leaves, Flowers, Peels

Methods of Preparation of Volatile Oils

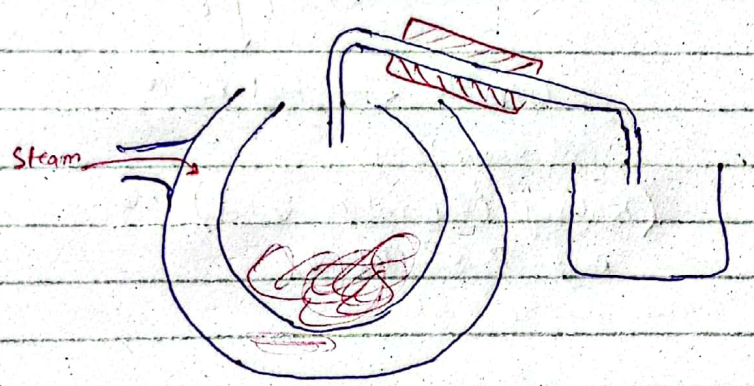
1. Distillation
   - Simple
   - Steam (Use for Heat labile substances)
2. Expression
3. Solvent Extraction
4. Enfleurage method

1. Distillation :- Separation of contents of mixture on the basis of B.P.



Simple Distillation

- Volatile Oil first receives in Receiver flask
- Condensor contain cold water (7/8/9°C)



Steam Distillation.

- Jacketed containe (Double walled)
- Steams usually applied in ↑ b/w walls.
- No direct contant of plant with steam so no distruction occur.

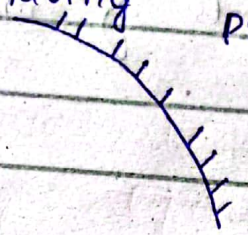
Use for;
- Peppermint
- Spearmint
- Clove

2. Expression :- Pressing something (ابھی)
- Roller mills are used

Extraction used to take v. oils from peels

Bitter orange Orange Lemon

A machine having poinling projection is used.



The peels press by that machine. so the oil gland burst and oil exudes out

3. Solvent Extraction :-

Any part (Fruit / leaves / Flower)

↓

Crushed → Put in pure solvent

wait for few days

↓

Evaporate ← Filters it

at Room temp

(Rotary Evaporators used)

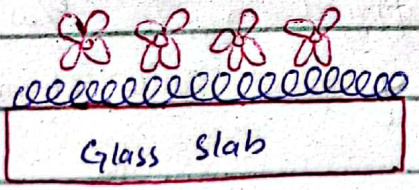
Reduce P So B.P ↓

4. Enfleurage

Use for Highly Hydrophobic and ~~Bodies~~ Delicate parts

↓

Flowers.



* Hydrophobic oil goes into fat and fats color changes and become saturated. Remove the old and place a new fat.

Classification of Volatile Oils

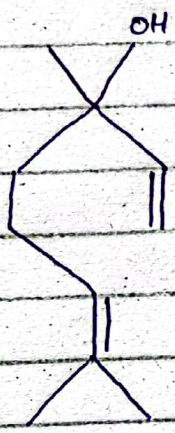
1. Hydrocarbon V.O :-
   1. Terpentine oil
   2. Cubeb
2. Alcoholic V.O :-
   1. Peppermint پودینہ
   2. Coriander دھنیا
   3. Cardamom الائچی
3. Aldehyde V.O :-
   1. Bitter orange peel
   2. Sweet " "
   3. Lemon
   4. Cinnamon
4. Ketone V.O :-
   1. Camphor کافور
   2. Spearmint
   3. Caraway زیرہ
   4. Buchu
5. Phenol V.O :-
   1. Laung / Clove
   2. Thyme
6. Phenolic Ether V.O :-
   1. Fennel سونف
   2. Anise
   3. Nutmeg / Myristica
7. Oxide V.O :-
   1. Eucalyptus
   2. Chenopodium
8. Ester V.O :-
   1. Rosemary
9. Missaleneous V.O :-
   1. Allium — Garlic
   2. Anethum

Coriander

Synonym:- Dhaniya (Hin.)
Fructus coriander
B.O :- Coriandrum sativum
Family:- Umbilliferae
Part used:- Dried ripened fruit

Chemical Constituents:- Alcoholic Volatile Oils 1%

- Linalool
- α- pinene
- Borneol
- P-cymene



(Linalool)

Uses:-

- Carminative
- Flavouring Agent
- Condiment
- Anti-spasmotic.

Fennel :-

Synonym :- Saunf

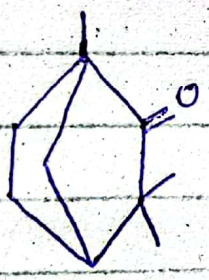
B.O :- Foeniculum vulgare

Family :- Umbilliferae

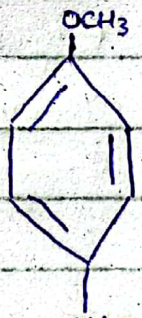
Part used :- Dried ripe fruit.

Chemical Constituent :- Volatile Oil (2-6%)

- Fenchone (20%)
- Anethole (50%)



(Fenchone)



(Anethole)

Use :-

(Same as previous)

- Digestive Aid
- Stimulant

. ہیں Tannins کی Bark کی

Cinnamon:

Synonym:- Darchini

B.O:- Cinnamomum zeylanicum

Cinnamomum loureirii

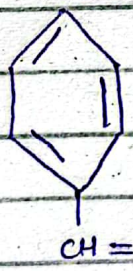
Family:- Lauraceae

Part used:- Dried bark

Chemical constituents:- * Volatile Oil 1–6%.

- Cinnamaldehyde (65%–70%.)
- Eugenol (4%)

* Tannins



Uses:-

(Same as Coriander)

- Anti-septic (Due to tannins)
- Expectorant

Lemon Peel :-

Synonym :- Fructus Limoni

B.O :- Citrus limon

Family :- Rutaceae

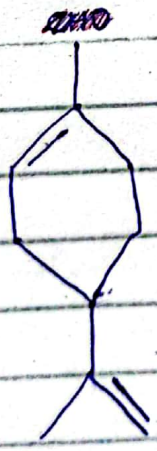
Part used :- Dried peel of fruit

C. Constituents :-

* Aldehyde V.O (2–3%)
  - Limonene (90%)
* Vitamin-C
* Flavenoids
  - Hespiridine

Use :-

- Carminative
- Flavouring Agent
- Mosquito repellent
- In cosmetics → citrus fruits used for Bleeching.



(Limonene)

Bitter Orange Peel :-

Synonym:- Fructus aurantii

B.O:- Citrus aurantium var. amara

Family:- Rutaceae

Part used:- Dried peel/rind of the fruit

Chemical constituents:-

* Aldehyde V.O (1-3%.)
  - Limonene
  - Citral
  - Citronellal
* Vitamin-C
* Flavenoids
  - Naringin
  - Hespiridine

Uses:-

- Stomachic
- Carminative
- Flavourant

Sweet Orange Peel

Synonym:- Fructus aurantii

B.O :- Citrus aurantium var. sinensis

Family:- Rutaceae

Part used:- Dried Peel of fruit

Chemical Constituents:-

* Volatile oils (1-3%)
  (Same ↓ as previous)
  - Limonene (80-90%)
  - Citral
  - Linalool
* Vitamin-C

Uses:

- Carminative
- Flavourant
- Stomachic
- Facial care Product — Management of Acne vulgaris

CamScanner

Camphor :-

Synonym :- Gum camphor, 2 – Camphonane

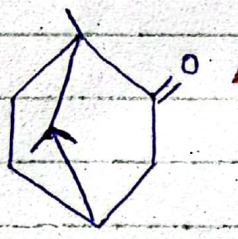
B.O :- Cinnamomum camphora

Family :- Lauraceae

Part used :- Dried woody parts (Stem & Bark)

Chemical Constituent :- * Volatile oil

Solid at room Temp. and it have smell b/c of Sublimation. i.e Solid ⟶ Vapours.



(10 – C Atom)

- Camphor
- Camphene
- Pinene
- Limonene

Uses :-

(Same as of volatile oils)

- Insect Repellent (Pesticides)
- Rubifacient
- Counter irritant
- ~~Pesticides~~ It was part of Embalbing Fluids

ممی والے جو ممی بناتے ہیں اس چیزوں پر کافور ڈالتے ہیں تاکہ جراثیم اس تک نہ پہنچے

Folia means leaves.

Buchu

Synonym :- Folia buchu

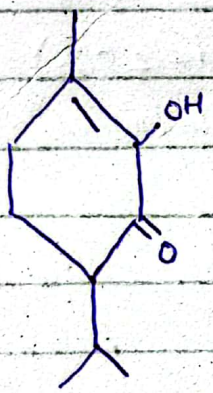
B.O :- Barosma betulina

Family :- Rutaceae

Part used :- Dried leaves

Chemical Constituents :- * Volatile oils 5-7%

- Camphor
- Diosphenol



* Flavenoids
  - Digsmin
* Mucilage
* Resins

(10-C Atoms
2-Isopren Atoms)

Uses :-

- Urinary Anti-septic
- Diuretic
- ℞ Same as of U.O without Flavourant

Father of Taxanomy = Carlous Linnius. Phenolic derivative = Anti-septic. QQ

Clove (Exam imp)

Synonym :- Laung, Syzygium aromaticum

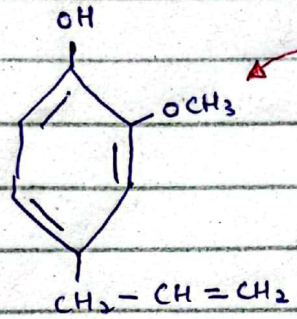
B.O :- Eugenia caryophyllus

Family :- Myrtaceae

Part used :- Flower bud

Chemical Constituent :- * Volatile oils (5-10%)

- Eugenol (85-90%)



(Phenolic derivative)

* Tannins (14-20%)

Triterpenoid derivatives (10-13%)

Use :- Phenolic der.

- Anti-septic (~~Anti-septic~~)
  - ↳ Phenol leaves a stain of brown colour so we make phenol derivatives such as Dettol etc which can't leaves the stain.
- Tooth Ache. Not in any other place instead of tooth
  - ↳ Because it has local Anesthetic Action
  - ↳ Desensitize the expose nerve endings.
  - ↳ Its also b/c of type of pain Tooth pain is localized and other pain are not localized they are dulled (overall). Tooth fibres send sharp signals.

Tooth fibres Exposed

All other " Not exposed.

• Ice is mode of Ephedrine (Hypertensive)

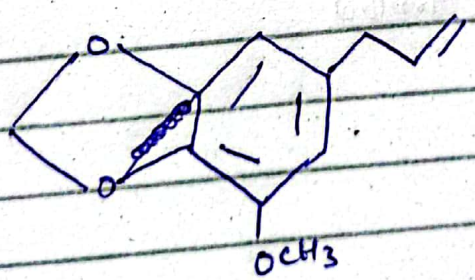
Nutmeg :-

Synonym :- Jaifal (جائفل)
B.O :- Myristica fragrans
Family :- Myristicaceae
Part used :- Dried Arills & Mace of seed

C. Constituents :-
* V. Oil (5-10 %.)
  - Toxic in higher quantity. CNS Stimulant & they Rxn like Amphetamine.
    - Myristicin → Auditory & Visual Hallucination
    - Elemicin
    - Isoelemicin
* Fat (Nutmeg butter) (30-40%.)
* Starch
* Coloring Pigment

Uses :-
- Same as of volatile oils.

• Ice is b/c of Blood Pressure./ Stroke.
When B.P Res in Brain the Brainpart touch the cronium and that part of Brain died.



ضروری نہیں ہے۔

(11-C Atom myristicin)

Eucalyptus :-

Synonym :- Gum wood oil, Gum Tree oil

B.O :- Eucalyptus globulus

Eucalyptus Australiana

Family :- Myrtaceae

Part used :- Dried leaves

C. Constituents :- * Volatile oils (3–6%)

- Eucalyptol (80–90%)
  Or Cineole

* Resins
* Tannic Acid
* Flavenoids

(10-C Atom)

Use :-

1. Eucalyptol is Anti-septic and is presents in mouth washes b/c of its coolness.
2. Insect Repellent
3. Rubafacient & Counter irritant
4. Carminative
5. Flavourant

Chenopodium :-

Synonym :- American wormseed oil Ambrosia oil

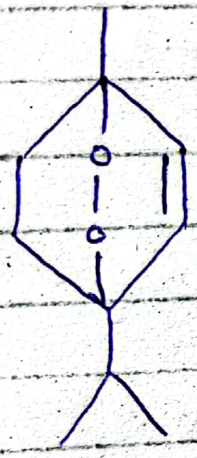
B.O :- Chenopodium ambrosiodes

Family :- Chenopodiaceae

Part used :- Dried Aerial parts (leaves, stem, Flowering Tops twigs [Branches])

C. Constituents :- Volatile oil (1-4%)

- Ascaridol (70%)
- Limonene
- p-cymene
- camphor



(Per-oxide Bond)

(10-C Atom)

Use :

1. Anthelmintic (Against worms) Vertamary use special Round And Hook worms
2. Amebiasis

Cardamom :-

Synonym:- Elaichi, Grains of Paradise

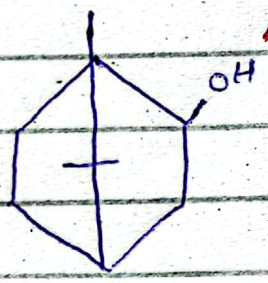
B.O:- Elettaria cardamomum

Family :- Zingiberaceae

Part used:- Fruit and Seed.

C. Constituents :- * Volatile oil (3-8%)

- Cineole } (70%)
- Borneol
- Sabinene
- Terpineol
- Limonene



* Fixed oil
* Starch

Uses :-

(Same as of volatile oils)

1. Herbal tea preparation.

Garlic :-

Synonym :- Lehsan

B.O :- Allium sativum

Family :- Liliaceae

Part used :- Dried Bulb

C. Constituents :- * Volatile oil (upto 0.1%.)

- Sulfer containing.
- They are irritant so when they touch when Sclera of Eye. irritation start & Protective Reflexes i.e tears start.
  - Allicin
  - Alliin
  - Allyl propyl disulfide
  - Diallyl disulfide.

* Amino Acid
  - Methionine
  - Cysteine
  - Leucine
  - Valine

Uses :-

1. Condiment
2. Carminative
3. Anti-Hypertensive

Turpentine Oil :-

Synonym :- Rectified oil of terpentine.

B.O :- Pinus palustris
Pinus longifolia

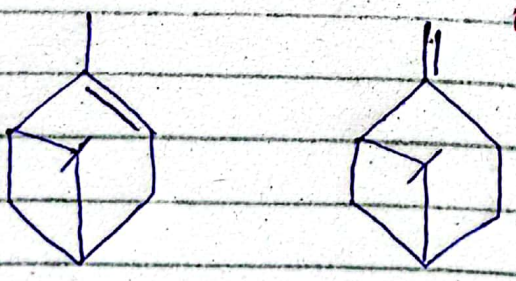
Family :- Pinaceae

Part used :- It is obtained from oleoresin present in the Bark Or trunk of tree by Distillation.

Turpentine oil.

C. Constituents :- Volatile oil (7- 10 %)

- Major → α- pinene (30 %)
- β- pinene (10 %)
- Phellandrene
- Limonene
- Camphene
- P- cymene



Use :-

1. Rubifacient
2. Counter irritant
3. Formulation of Paints And Varnishes (Polishes)

Caraway :-

Synonym :- Fructus carvi ، زیرہ

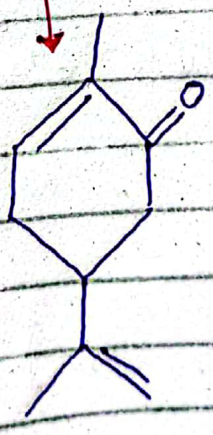
B.O :- Carum carvi

Family :- Umbelliferae

Part used :- Dried fruit (ripened)

Chemical Constituents :-

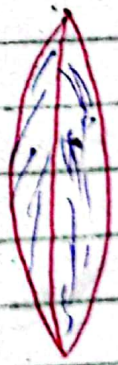
* Volatile oils (2-7 %)
  - ~~Anethole (50-60%)~~
  - ~~Fenchone (--20%)~~
  - Carvone (50-60%)
  - Dihydrocarvone
  - Limonene
  - Carveol
  - Dihydrocarvacrol
* Fixed Oils (12%)



Uses :-

Same as of volatile oils.

Fruits کو Family اس ~~کہتے ہیں~~ Cremocarp ~~کہتے ہیں~~ ۔ Fruits کھلنے کے بعد نیچے گرتے ہیں ۔ Mesocarp کو کہتے ہیں ۔ اس Family کے Fruit دو برابر حصوں میں تقسیم ہوتے ہیں ۔ Shizocarp کہتے ہیں ۔ پھر Shizocarp Longitudinal طور پر Rigid ہو سکتے ہیں اور Cremocarp ہے تو Shizocarp کے ایک حصے کو Mericarp کہتے ہیں ۔



Dill :-

Synonym :- Fructus Anethi

B.O :- Anethum gravedens

Family :- Umbelliferae

Part used :- Dried ripened Fruit

Chemical Constituents :- Volatile oils (2–6%)

(Major V.O)

- Carvone (20–45%)
- Dihydrocarvone
- Dillapiol (15%)
- Phellandrene
- Terpinene

Uses :-

Same as of voldile oils

Anise :-

Synonym :- Fructus Anisi

B.O :- Pimpinella anisum

Family :- Umbilliferae

Part used :- Dried ripe fruit

Chemical Constituents :- * Volatile Oil (1-4%)

- Anethole (90%.)
- Chavicol
- Methyl chavicol

* Proteins & Starch.

Uses :-

Same as of V.O

Thyme :-

Synonym:- Folia thymus

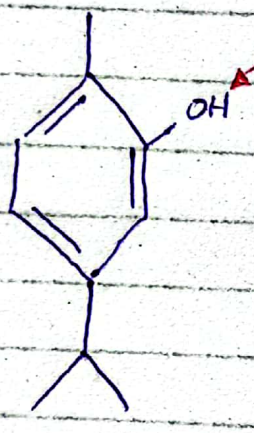
B.O:- Thymus vulgaris

Thymus zygis

Family:- Labiatae / Lamiaceae

Part used:- Dried leaves & Flowering tops, Aerial portion.

Chemical Constituents :- Volatile oil (At least 1.2%)



- Thymol (35–55%)
- Carvacrol
- P-cymene
- Terpinene

Uses :-

- Antiseptic / Antibacterial (Thymol) Disinfectent
- Same as of V.O.

Rosemary :-

Synonym:- No Synonym OR Oil of Rosemary

B.O :- Rosemarinus officinalis

Family :- Labiatae Lamiaceae

Part used :- Leaves & Flowering tops

Chemical Constituent :- * Volatile Oil (1-2%)

- Cineole / Eucalyptol
- Borneol
- Camphor

* Saturated Aliphatic Hydrocarbons.

Uses :-

Same as of 11.0

Cubeb :-

Synonym :- Tailed pepper کباب چینی

B.O :- Piper cubeba

Family :- Piperaceae

Part used :- Dried Ripe seeds

Chemical Constituents :- Volatile oils (15%)

- Cubebene
- Cubebin
- Cineole
- Sabinene (50%)
- Camphor

Use :-

(Same as of V.O.)

- Carminative
- Flavorant
- Condiment
- Upper Respiratory Tract Infections.

CamScanner

Carbohydrates (important)

Organic biomolecules which are polyhydroxy derivatives of Aldehydes & ketones and their derivatives

OR

Complex organic biomolecules which upon hydrolysis yields simple sugars that is (i.e) Polyhydroxy Aldehyde and ketone

Classification :-

1) Monosaccheride
   - Triose
   - Tetrose
   - Pentose
   - Hexose
   - Heptose

   [On the Basis of No. of C.]

   - Aldose
   - Ketose

   [On the Basis of Fenctional Group]

2) Oligosaccheride
   - Disaccheride
   - Trisaccheride

3) Polysaccheride
   - Homo PS
   - Hetero PS

4) Derived Carbohydrate
   - Glycoamino Glycons GAGs
   - Lipopolysaccheride.
   - Acids & Alcohol of CHs.

Aldose → Glucose

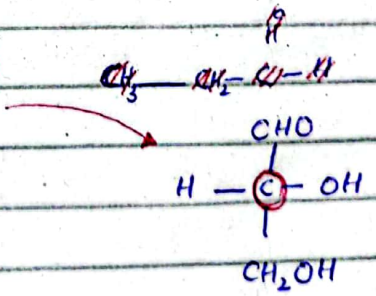
ketose → Fructose

Triose → Glyceraldehyde (Glycerose)

(Simpleset carbohydrate)

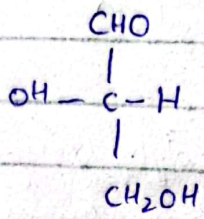
(3 – Carbon)

2 – Carbon not exist

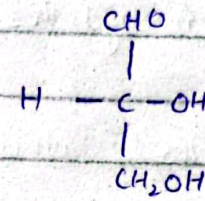


2 - Carbon HCs Not Exist?

All carbohydrates have Assymetric carbon which is necessary so 2-carbon (CHO |) have no Chiral Or is not HCs.



L-Glycerose.



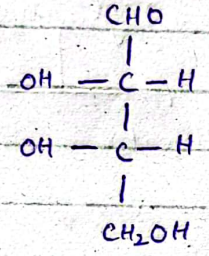
D- Glycerose

Mirror images = Enantiomer

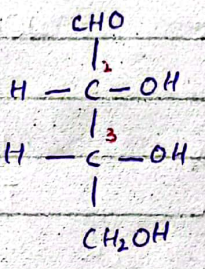
d = + l = −

D = ~~Dextrorotatory~~ L = ~~Levorotatory~~.

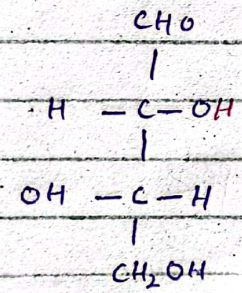
D and L are configuration they are enantiomer, they present the position of OH Group. & they depend upon on 2nd last carbon.



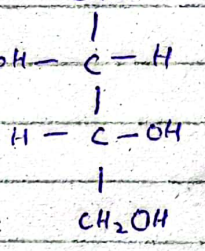
L- ~~Threo~~se Erythrose



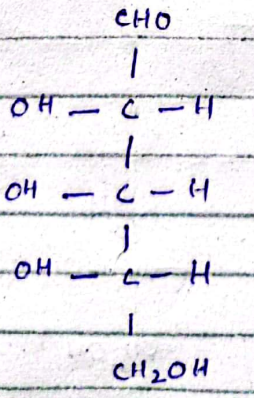
~~D-Threose~~ D-Erythrose



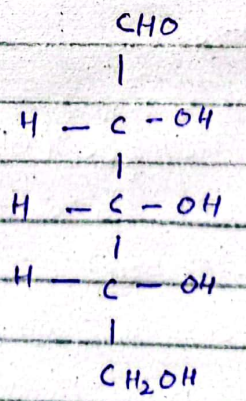
L- ~~Threo~~ Threose.



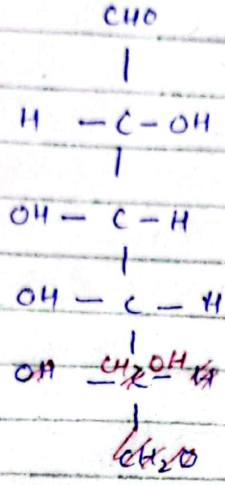
D- ~~Threose~~ Threose



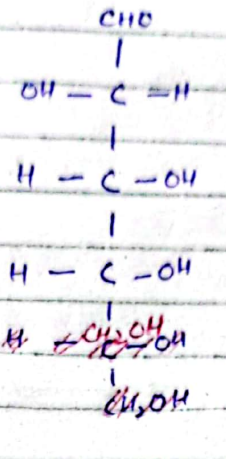
L-Ribose



D- Ribose



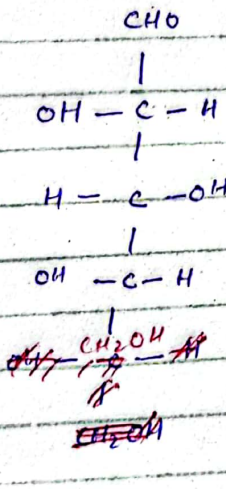
L-Arabinose.



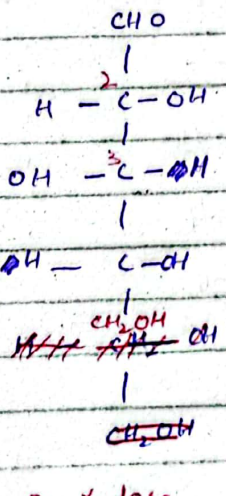
D-Arabinose

* D-Arabinose and D-Rabinose are stereoisomers having different position of only one OH Group. This type of isomers are called Epimers.

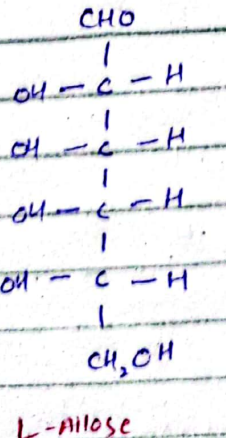
* D-Xylose is C3 Epimer of D-Ribose



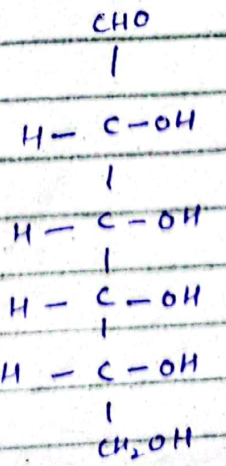
L-Xylose.



D-Xylose

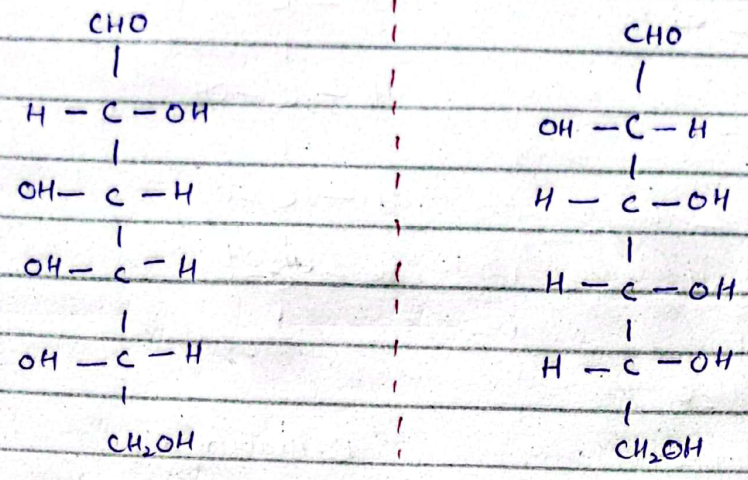


L-Allose



D-Allose

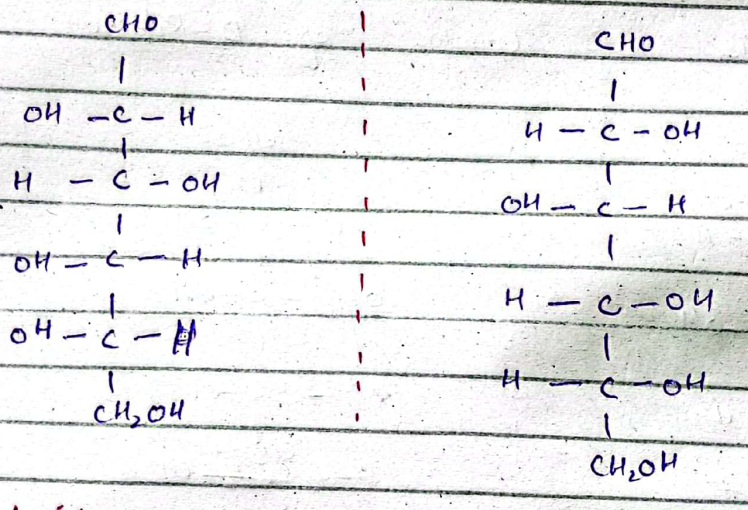
* D-Altrose is C2 Epimer of D-Allose



L-Altrose

D-Altrose

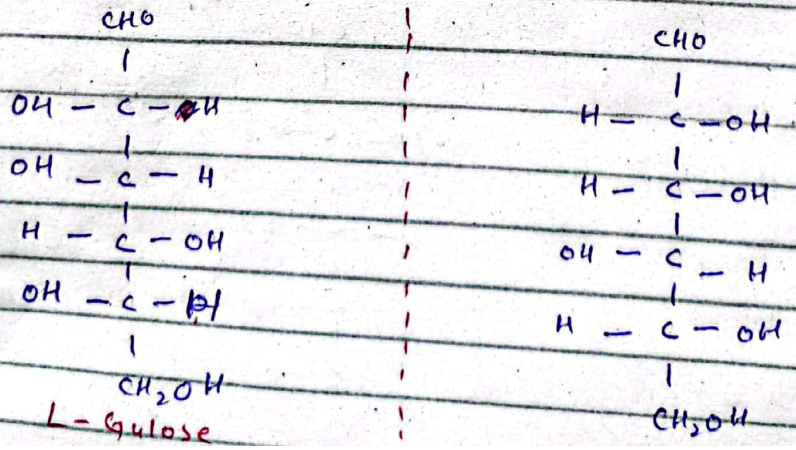
* D-Glucose is C3 Epimer of D-Allose



L-Glucose

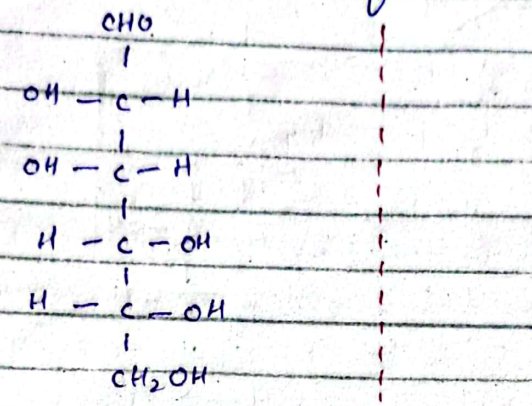
D-Glucose

* D-Gulose is C4 Epimer of D-Allose

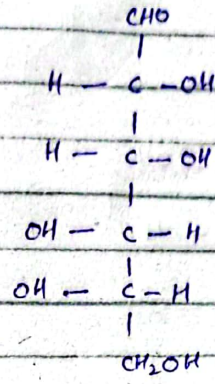


L-Gulose

* D-Mannose → C2 Epimer of D-Glucose.

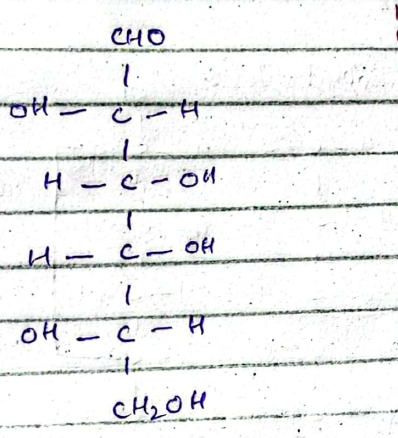


L-Mannose.

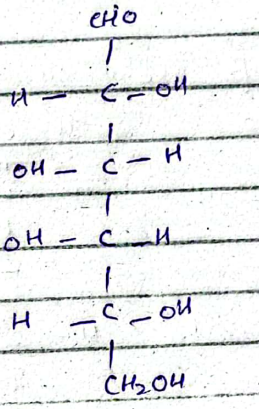


D-Mannose

* D-Galactose C4 Epimer of D-Glucose

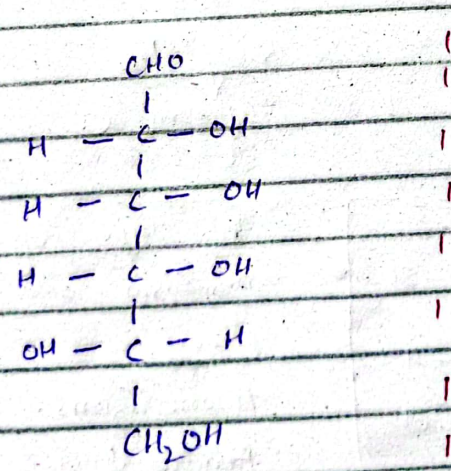


L-Galactose.

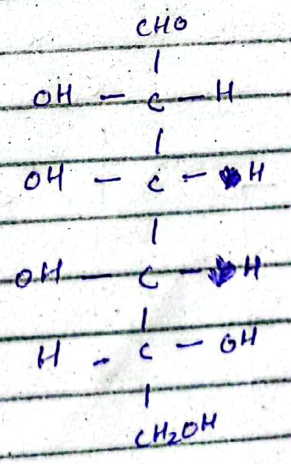


D-Galactose

* D-Talose C2 Epimer of D-Galactose

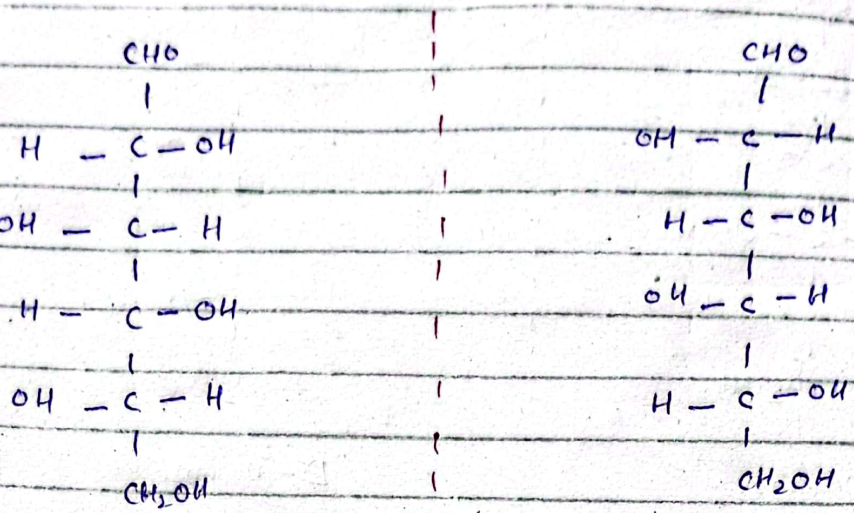


L-Talose



D-Talose

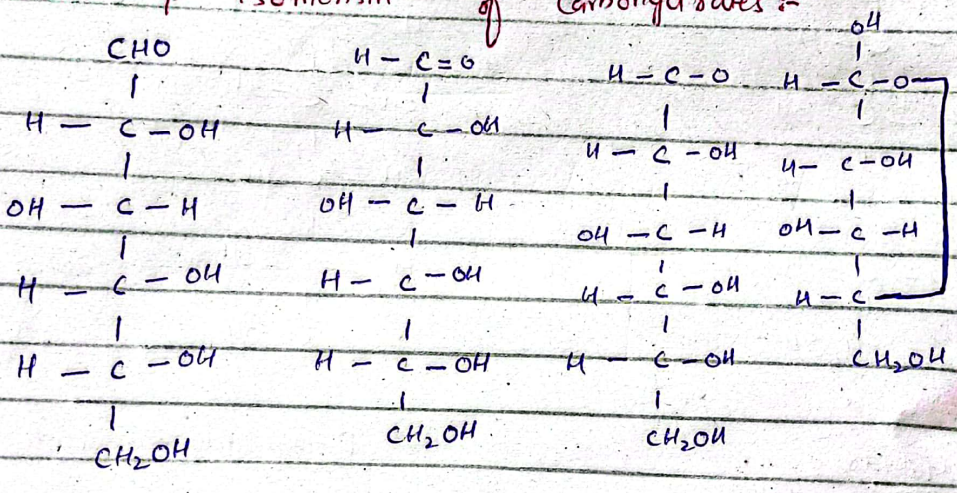
* D-Idose :- C-3 Epimer of D-Talose



L-Idose.

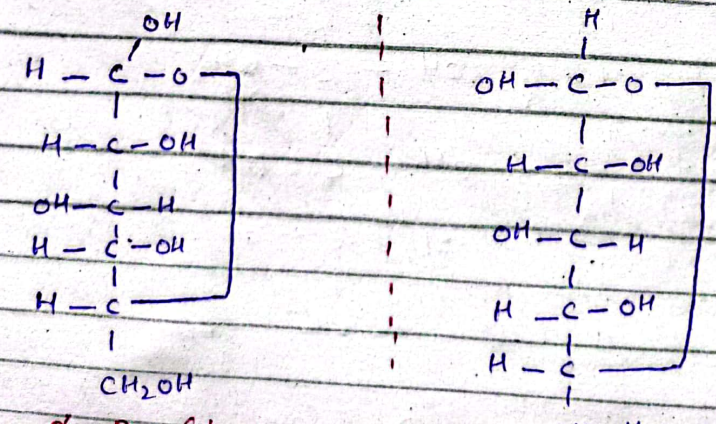
D-Idose

* α and β isomerism of Carbohydrates :-



D-Glucose

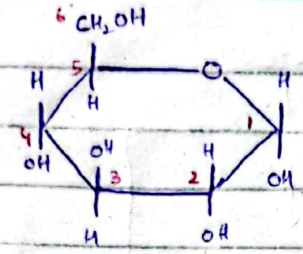
- Carbohydrate in soln. form made Ring b/w Functional Group Carbon and Last Assymetric C.



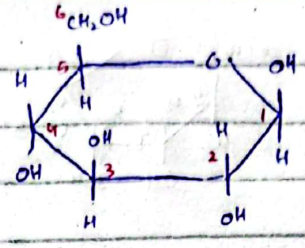
This type of isomerism are known as Anomerisims.

Functional Group

C = Anomeric Carbon



α-D Glucose



β-D-Glucose

Carbon No. 5 ⇐ ⇒ Ring form ⇐ ⇒ Carbon No. 1 ⇐ ⇒ Oxygen Carbon ⇐ ⇒ Right ⇐ ⇒ Linear ⇐ ⇒ Left

Fructose :-

- Also known as fruit sugar / levulose
- Obtained from by crystallization of High fructose corn syrup. (HFCS)
- Present in sweet fruits.

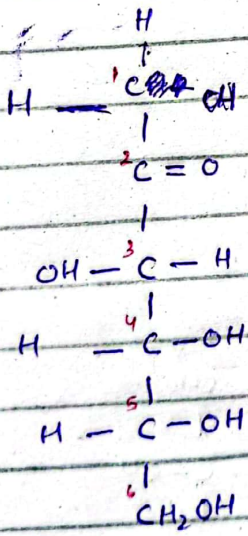
Made from starch → Hydrolyze → Glucose ⇌ (isomerism) Fructose → HFCS

- Pharmaceutically mostly used Corn starch.

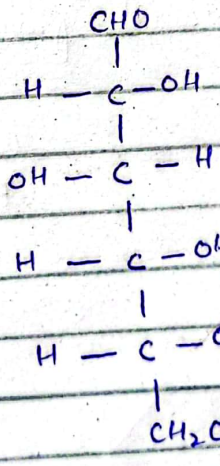
B. Name:- Zee mays

Family:- Gramineae

Poaceae (New name)



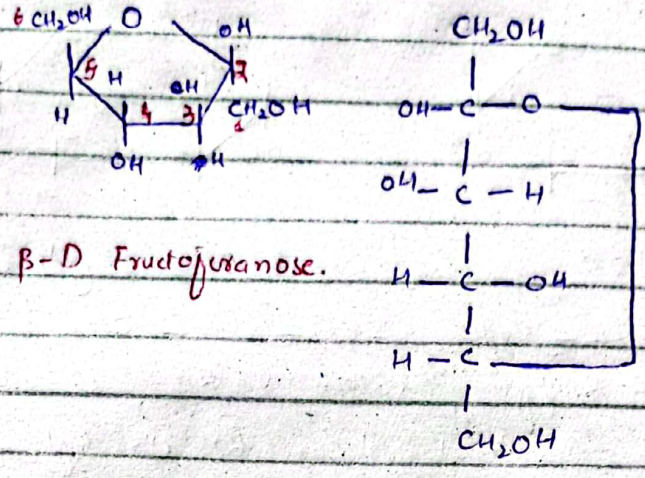
Keto form.



D-Glucose

Aldo form

Table sugar = چینی (Sucrose)



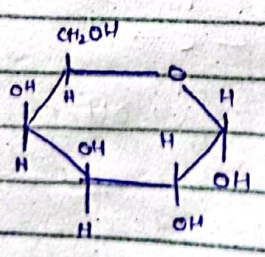
β-D Fructofuranose.

Uses :-

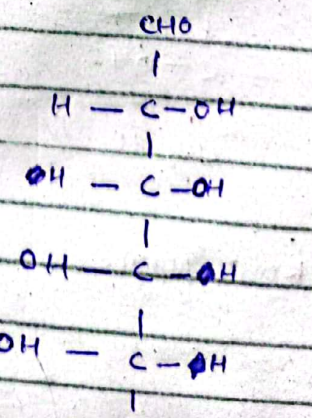
1. Sweetening Agent
   Use in chewable tablets, Backery prodod and confectionary (ٹیبلٹ)
2. HFCS use by obsese patient.

Glucose

- Also known as Dextrose / Grape sugar / D-Glucose.
- Commercially obtained from Starch b/c starch is made from Glucose
  - Starch —(Enzymatic Hydrolysis)→ Glucose.
- Starch obtained from Corn Starch.
  - B. Name : Zee mays
    Family :- Gramineae
    Poaceae.



α- D Glucose



Use:- Sweeking agent
- Pre-digested food
  - Cerelac (Infant foods)
- Dextrose IV infusion.
  - (5%) for isotonicity
  - Tonicity Adjuster
- In coma patients / cancer. pre-digested foods are given. Known as total parenteral nutrition (TPN)
- Liquid Glucose: used as tablet binder.
  - " " Viscosity enhancer
  - " adulteration of Honey

Sucrose

Also known as; Cane sugar, Beet sugar, Saccharose
Table sugar

Made from :- * Sugar cane — Cane - Sugar
B.O:- Saccharum officinarum
Family:- Gramineae
Have 15-20% sugar by wt.

* Beetroot
B.O:- Beta vulgaris — Beet - sugar
Family:- Chenopodiaceae.
Have 10-17 % sugar by wt.

- 80% sugar production from sugar cane.
- Biggest exporter of Table sugar → Brazil

- Sugar cane production occur in tropical zone (HOTTER than this)
- Beet sugar — " " temperate zone

- Sugar became common in 20th century before it was common in [illegible]
- First of crystal of sugar produced by India.
- Table sugar have

When north american discovered sugar.

1) African slaves were bought to work in field
2) Sugar produce.
3) Sugar was traveled to Europe
4) Profit makes and bought many slaves and many of slaves come into slavery due to table sugar.

Production:-

1) Crush sugar cane
2) Juice obtained and the Rest of material remains called Bogasse which is used as Fodder / Fuel
3) Boil the Juice b/c to denature the protein, (some protein rise to top and some settle down)
4) Skim it (اوپر سے نکالنا)
5) If protein not rise to top, Add $Ca(OH)_2$ (Slaked lime) Reaction occur.

$$Ca(OH)_2 + CO_2 \text{ (passes)} \rightarrow CaCO_3 + H_2O$$

- ↑es the pH b/c of Alkalinity
- ↑es pptation and denaturation.

6) Filter it
7) Then place it in Evaporater to Evaporate and remove excessive H_2O and syrupy liquid obtained called Mulasses.

8) Then ~~crystr~~ seeding of processing occur. (to make sugar you need some sugar as seed) to accelarate formation of crystals

9) Centrifugation occur by which
- Crystallize sugar Remain
- Liquid separates (Molasses) → Seeding → Centrifigation

Sugar obtained is not white in colour. it is brown b/c of small amount of Molasses.

10) Decolonize the sugar by Adsorption of pigments present in sugar by use of Carbon colums (Adsorbant) and white color obtained.

11) Seiving occur to attain unifom size.

Brown sugar is expensive than White sugar b/c Brown sugar is more natural than white sugar.
گڑ is better than sugar.

Uses :-

1) Sweetening Agent
2) Diluent in chewable tablets
3) Venicle in syrup preparation.
- Simple syrup BP = 66.7 % w/w
4) Compressable sugar — Pharmaceutical grade
- its size is large and Granular.
- Use in direct compression method of chewable tablets b/c of its good flow.
5) Use As confectioners sugar (پسا ہوا شوگر)
- Very sweet
- 95% Sucrose 5% starch.
6) Caramel (Burnt sugar)

When sugar is heated at 170°C ceramilization start (table sugar)
- Sucrose breaks down occur.
  - ↳ Polymerization of broken sugar occur → Taste developed
  - ↳ Fragmentati - - - → Odor developed

* All the monosaccheride can caramalise but temp is different.

Xylose

Also known as Wood sugar

Obtained from :- Wood of Bark/Trunk of
- Gymnosperm
- Angiosperm

woody ع ع ں ے ے ے

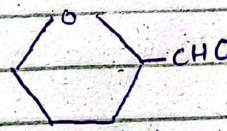
Reducing Sugar :-

- Benedict and Fehlings test use for it confirmation.
- When the Functional group is free whether it is aldehyde or ketone mean Functional Group not participate in covelant bond then they are Reducing sugar.
- All monosaccheride are reducing sugar
- Maltose :- Reducing sugar b/c one functional Group Carbon is free.
  [Glucose — Glucose]
  Have α 1 → 4 linkage
- Sucrose :- Non Reducing sugar, b/c both functional group carbon is not free.
  [Glucose — Fructose]
  (α1 → 2) α1 → β2
- Lactose :- Reducing sugar.
  [Glucose — Galactose]
  β1 → 4

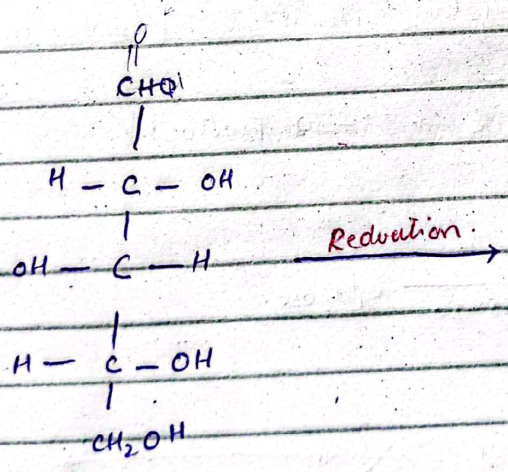
MCQ :- Xylose is Reducing sugar

Use :-

- Sugar substitute
- Industrial use of Xylose is to make tetrahydrofuran and furfural



Furfural



Xylose

Xylitol

- Xylitol is Artifical sweetener but less sweeter than sucrose and Xylose It is 0.6 sweet., It is use b/c

- کل 27 MCQs آئیں گے Xylose

of no teeth infection.

↳ Sugar are aldehyde and ketones, when they oxide Acid formed which are corrosive and teeth may infect But Xylitol is difficult to make Acid b/c first it will form Aldehyde/ketone then Acid

Alcohol ⟶ Aldehyde/ketone ⟶ Acid.

↳ Diabetic patient use Aspartame but it is not sugar it is Amino Acid and 200 times sweeter than Sugar.

Inulin

- Polysaccheride carbohydrate
- Present in plants and it serves as storage material.
- It is a form of stored carbohydrate

Common form of carbohydrate = Starch

کہتے ہیں stored form جسے = Inulin.

- It is present as storage form of carbohydrate in the roots of family Compositae.

Example کے لئے ⟶ Helianthus tuberosus ← B.Name (Sunflower)

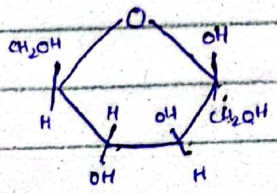
- Fructose form polymer Fructan which is present in Inulin

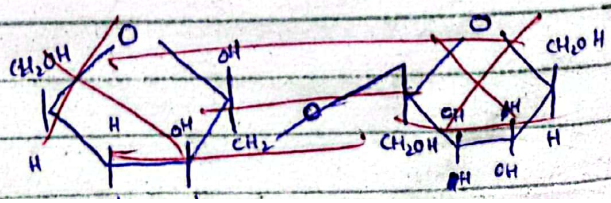
04 inulin have → 35-50 Fructose

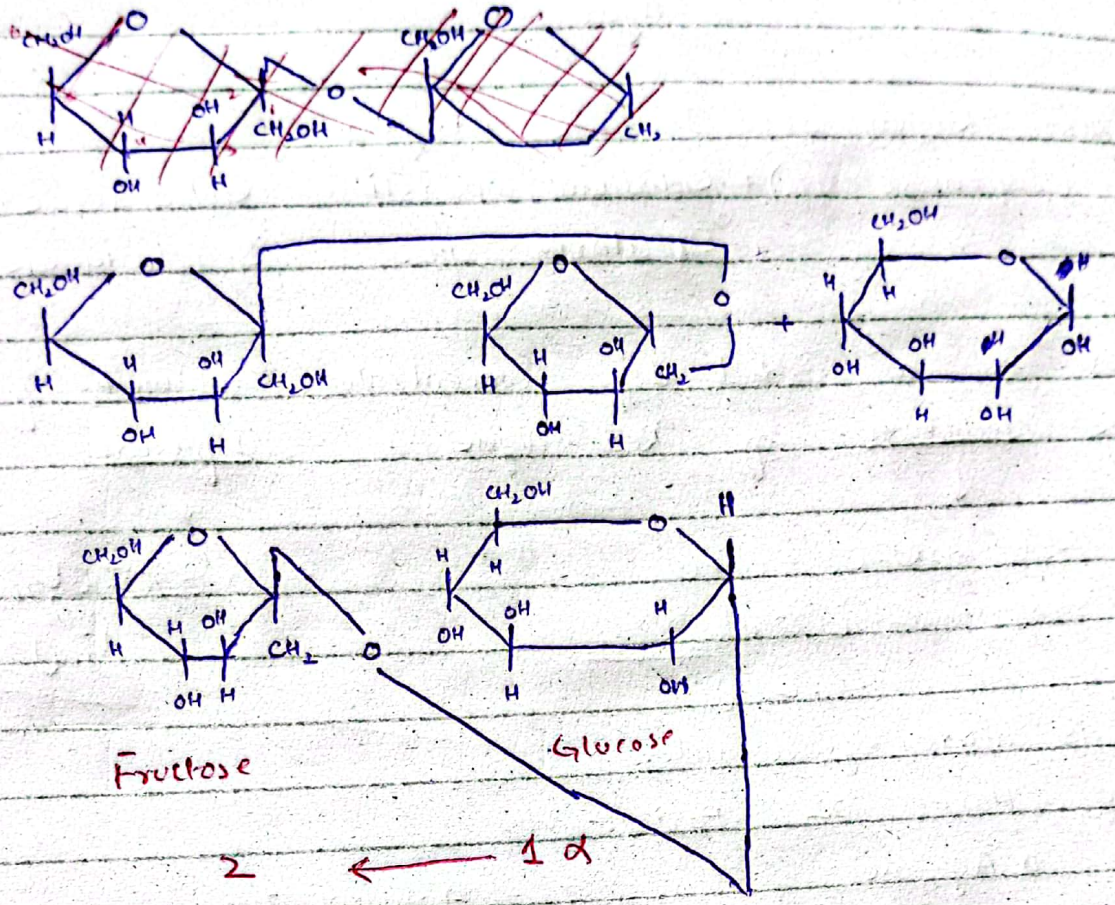
Structure :-

Fructose — (Fructose)$_{35-50}$ — Glucose.

β-2 ⟶ 1







Uses :- (Why it is important?)

1) Inulin is not metabolized in human body so it excrete as such.

2) Inulin excrete all only by 01 mechanism. which is Filteration Glamerular.

So it is use for Diagnosis of kidney infection, Determination of GFR

Normal GFR :- 120 – 125 ml/min

180 L/day.

- GFR ↓es → Glomerulonephritis
- ESRD → (GFR ↓es) End stage Renal disease.

Agar

Also known as: Japanese isinglass

(Japonese spp.) → Gelidium amansii — Gelidiaceae

Gracilaria spp. — Gracilariaceae

- It is a solid dry concentrate obtained from the decoction of Red Algae

Infusion

- It is heteropolysaccheride.

Agar Have 02 Parts :-

1) Agarose

2) Agaropectin

Agar $\xrightarrow{\text{Hydrolysis}}$ D & L- Galactose + Sulphate

Does not contain sulphate — Contain sulphate

Use :-

1) Nutrient Agar media
2) Blood " "
3) Chocolate " "
4) Agarose can separate from Agar and make Ge of it use in Electrophoresis of Revesse Transcrip PCR.

Acacia

Acacia	Tragacanth
Also known as	
Gum Arabica, Kordofan gum	, Shiraz Gum
Botanical Name	
Acacia senegal	Astraglus gummifer.
Acacia milotica	
Family :- Leguminosae.	
Part used :-	
Dried Gummy exudate obtained by incision into trunk	
Acacia Gum takes time	Tragaceth comes out immediately
Water Solubility :-	
More water soluble	Less
Present in;	
Gum made in cambium region	Gum made in pith and medullary rays

Chemical constituents

- On hydrolysis it yield
  - * Arabic Cat salt of
    - Arabic Acid
    - Degalactose
    - L-Rhamnose
    - L-Arabinose

- Traganth has 02 portion.
  - Water soluble: Tragacanthin
  - Insolube: Basorin

On Hydrolysis it yields;

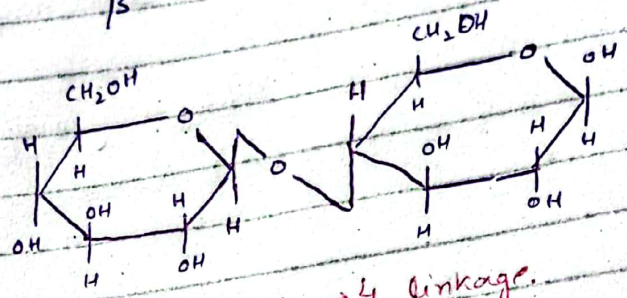
- Galcturonic Acid, Degalactose, L-Arab and D-Xylose.

Uses :- (Both Have same use)

Thickening agent
Viscosity enhancer
Emulsifying agent
Suspending agent

Cellulose

- Homopolysaccheride of Glucose (β-D) carbohydrate having β-1→4 linkage.



β-1→4 linkage.
Cellubiose Unit

- Cellubiose in undigestable by Human body.

Pharmaceutical Cellulose;

1. Powdered cellulose
2. Microcrystalline "
3. Sodium carboxymethyl cellulose

Powdered Cellulose

Method of Manufacturing :- By purification and mechanical size reduction of cellulose obtained by pulp of fibrous plant materials.

Use :- 1. Adsorbant
2. Table and capsule diluents/fillers
3. Suspending agent
4. Thickening agent

MCC

Brand Name :- Avicel
↳ 101, 102, 200
Flow properties is different, 200 is best.

Method

mineral acid soln. followed by filteration and spray draying of the Aqueous slurry to form Round porous pellets.

Spray Draying Aes Flow properties

Use :- 1. Adsorbant (20 - 90% conc)
2. Anti-Adherent (5 - 20% ")
3. Tablet & Capsule diluent (20 - 90% conc)
4. " Disintegrant (5 - 15% conc)

Practically use mainly DILUENT.

Sodium CMC

Also known as Carmellose sodium (BP)

Method of manufacturing:- By treating cellulose with Alkali soln. followed by reaction with sodium monochloro Acetate.

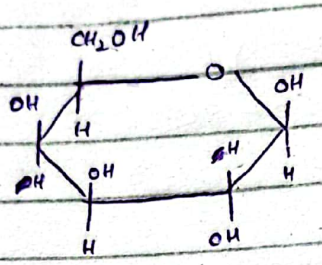
Uses:- 1. Suspending Agent (Formulation of thixotropic soln)
2. Emulsifying —
3. Gell forming —
4. Tablet Binder.
5. Paste manufacturing

Pectin.

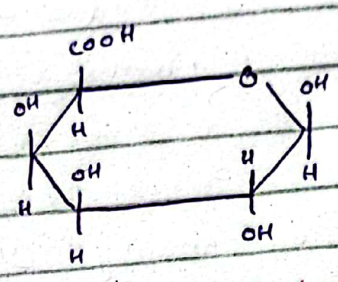
- Hetiropolysaccheride carbohydrate

Major constituent :-

β- D Galacturonic Acid, Xylose, Arabinose, Rhamnose



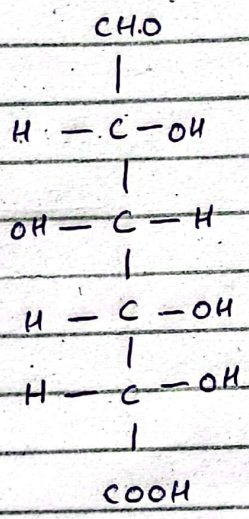
Galactose



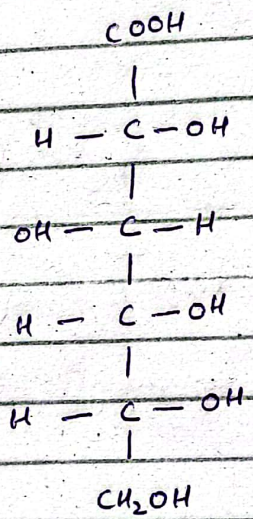
β-D Galacturonic Acid.

* Monosaccheride form 03 - Acids

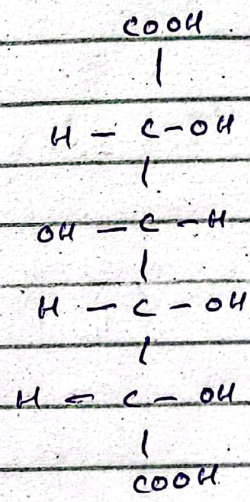
Glucose → Glucuronic
Glucose → Glucaric
Glucose → Gluconic.



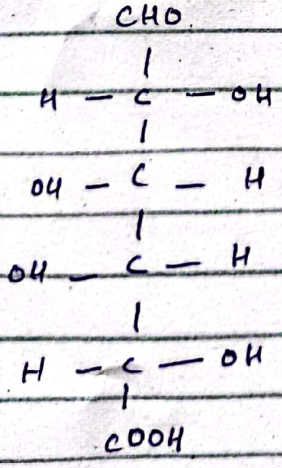
Glucuronic.



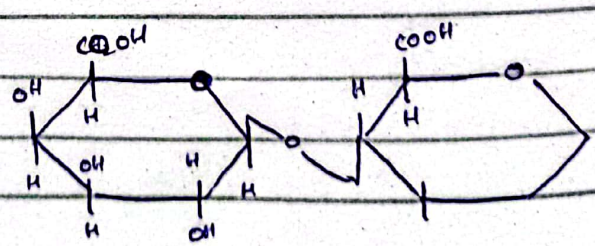
Gluconic



Glucaric



Galacturonic Acid.



β 1-4 Galactose.

Present in:-

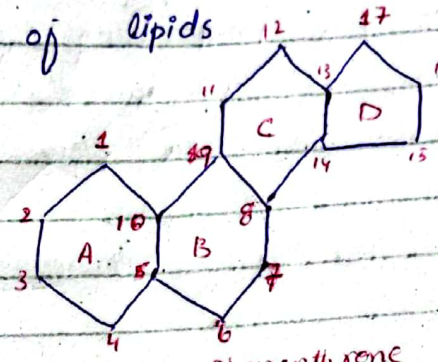
- Present in unripened fruits. and impart hardness to fruit. When fruit the Pectin hydrolyzed by Enzyme Pectases / Pectinases / Pectinesterases
- It is present b/w the cell wall (primary & secondary)

Use :-

1. Jamss, Jallies, Marmalades (مُرَبَّى)
   - i- Geling Agent
   - ii- Thickening Agent
   - iii- Viscosity enhancer.
2. Anti-diarrheal.
   - It has adsorbant property and Also Thicking agent & can Absorb toxin which causes diorrhea.
   - Non-infectious diorrhea
3. Wound dressing (topical)
   - Pectin + kaolin

Plant Steroids

- Steroids are class of lipids



Perhydro cyclopentano phenanthrene Ring
C-17

- In nature the above ring present in plant which is simplest steroid known as Gonane.

- Sterol is type of steroid having -OH group on carbon No. 3

- Sterol can be saturated / unsaturated. and a saturated sterol is called Stanol.
  ↓
  Having no double bond

Steroids Present in;

- Animals
- Plants
- Fungi
- Human → All sex Harmones, corticosteroids
  - Aldosterone → Mineralocorticoids
  - Cortisol (Stress harmone) → Glucocorticoids

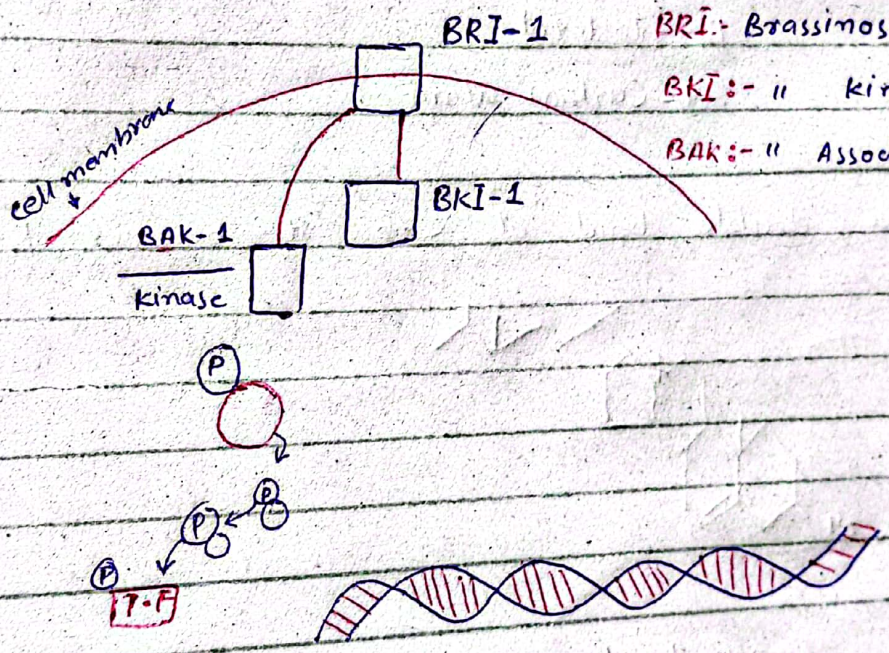
All steroids Have 02 important Functions;

1. In cell membrane, sterols are embedded b/c they are hydrophobic & maintain cell membrane integrity
2. Steroids (Harmones) involve in various signaling pathways

Before 20 years, new class of Harmones discovered called Brassinosteroids/ present in Brassicaceae. which involves

in the Plant growth ⟶ Promote cell elongation.
Reproduction ⟶ Auxin + Brassinosteroids cell division.
Differentiation ⟶ Vascular tissue
- Blood vessels → (Human.)
- Xylem, Phloem, Cambium → (Plant)

Stress Responce ⟶ Drought
↑es photosynthesis
Slight effect on stomata opening and closing
All above

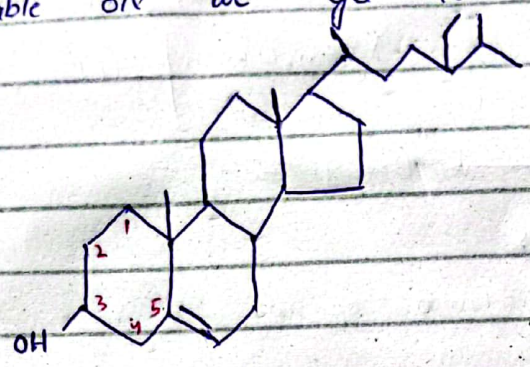


BRI:- Brassinosteroid inhibitor
BKI:- " kinase "
BAK:- " Associated kinase

Mechanism:-
In absence of Brassinosteroids, BRI-I binds with BKI-1 when " Bind " then BRI-1 dissociate with BKI-1 and binds with BAK-1. BAK-1 phosphorylates a protein which become activated and activate another protein and so on, then in this chain one protein come called Transcription factors which enter the Gene and start protein production.

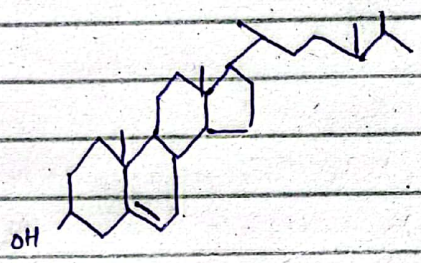
Phytosterols :-

- Plant sterols mostly β-sitosterol and by use of vegetable oil we get it.

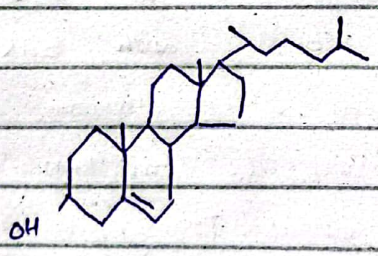


β-sitosterol
29- Carbon atom

- Remove double bond at C-5 it becomes β-sitostanol.



Camepesterol 28- Carbon atoms
Remove double bond at C-5 ⟶ Campestanal.



Cholestrol
27- Carbon atom.

Uses

1. Reduce blood cholestrol

One study conducted by giving 1.5 — 2.5g/day phytosterol for days to a person which reduce its cholestrol level 7 — 10%.

Treatment

Zylonic tab ... Allupurinol ...

Sapogenins

Aglycone of Saponin glycosides

Saponin —Hydrolyze→ Sapogenin + Sugar

2-Types of Saponins On the basis of Aglycone portion.

1. Steroidal → Less complex · C-27
2. Triterpenoid → more complex · C-30

It is called Saponin b/c it form ~~soap~~ Leather when mix with water b/c they reduce the surface / interfacial Tension.

Most Saponins are toxic b/c of reducing surface tension & in natures alkaloids are more toxic.

Dioscin —Hydrolysis→ Diosgenin (Starting material for • steroid synthesis • Birth control pills)

Sarsaparella & Dioscorea are steroidal saponins.

Glycyrrhiza are triterpenoid saponins

Commercially important Steroidal saponins :

- Diosgenin cause ↓es in
- Uric Acid level & effective
- in Hyperurecemia (Gout) b/c
- It cause reduction in
- the No. of URAT 1 Channel.
  - Responsible for absorption
  - of uric Acid from GF
- → It has anti-inflammatory
- effect by Reducing PG &
- Thrombaxin A_2.
- by inhibition of

Responsible for production of Prostaglandin ← Cyclooxygenase & Lipo-oxygenase → Responsible for production of Leukotrienes.

Causing ↑es in p53 protein and caspase-3 (Apoptotic enzyme) ← by

↑es in p53 = Cell death.

Due to above enzyme Apoptosis occur.

- → It has weak Anticancer property as well
- → Have slight Angiogenic effect

* Angiogenic effect :-

Angio refers to vessels

Genesis → means formation

(As suffex)

So means formation of new blood vessels & it is dangerous for cancer b/c it supply nutrients to that cancer cell.

Mechanism :-

Diosgenin is Anti-Angiogenic effect b/c it reduce the VEGF (Vascular endothelial growth factor)

↓

Induce blood vessel formation.

Blood.

* Statins are used for Reducing cholestrol level at night.
  ↓
  Atorvastatin.

When phytosterol is added to statins. it results 9-10% more reduction than only statin.

How Phytosterol Reduces Cholestrol?

By reducing its absorption from GIT.

Bile from liver → Gall Bladder (stored in)
↓ release
Duodenum → Emulsification → Reabsorbed

Sphaghol etc binds to bile and not reabsorbed.

Bile synthesized from Bile salts & Bile Acid which come from cholestrol when Bile reabsorption blocked, new Bile will produced from cholestrol and Blood cholestrol ↓ed.

2. Anti-oxidant.

Reactive Oxygen Species (ROS) – Guanine based – Apoptosis.
(Basic AA)

Withanolides

- Steroids
- Specifically Steroidal lactones
  - Contain cyclic Ester.
  - 28-Carbon compound.
- It is called withanolides b/c it found in Withania somnifera
  - Family:- Solanaceae
  - Synonym:- Winter Cherry

  and other plants of Solanaceae.
- Famous withanolides Withaferin A
  - Anti-cancer
  - Anti-inflammatory → B/c it suppresses NF-kB pathway

1. Inhibit MMP-2
2. — Neovascularization
3. — Cyclin D1
4. — Vimentin
5. — EMT

1. MMP-2:- Matrix metalo proteinase-2 :- In normal condition, they remodle the Extracellular matrix.
   - They have the ability to break connective tissue protein → Collagen

   tissue

   In b/w cell and Blood there is Basement membrane when this connective tissue broke down the cancer come from tissue to blood.

2. Neovascularization:- Angiogenesis

   i.e. Blood vessel ↑

3. Cyclin D1 Regulator of cell cycle.

   If it is inhibited then — — stop in G1 Phase.

and no cell proliferation / division / multiplication

4:- Inhibit Vimentin:- Intermediate filament, cell cytoskeleton and cell movement helps, maintain cell shape.
If it is inhibit chromosomal movement stopped. and cell division stops. & if shape not maintain it becomes less mature or immature.

- Ciliated Stratified Columnar Epithelium is present in our Trachea. Mucociliary Escalator present here which escalates dangerous or ↓ to mouth. When a person cigarette smokes this Escalator destroys & chances of lung concerete increases.

When Vimentin Inhibited
- No chromosomal movement
- No cell motility

5. EMT:- Epithelial to mesenchymal transition.
When it is inhibited No agressiveness of cancer cell occur.

Bile Salts

- Anionic salts of Bile Acids.
  - Present in Bile (80-98%)
  - Bile made in liver from cholesterol
  - — Stored " Gallbladder

Bile Acids Are 04;

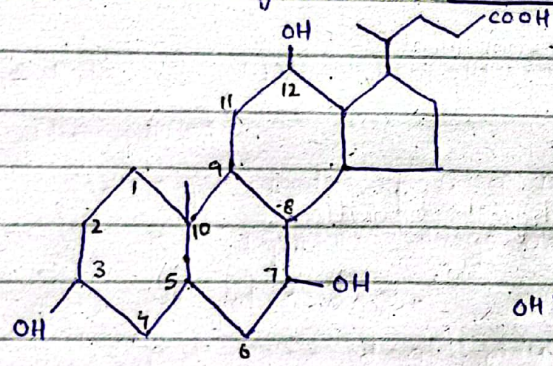
1. Cholic Acid
2. Chenodeoxycholic Acid.
3. Deoxy cholic acid
4. Lithocholic Acid

1 & 2 → Primary Bile Acids → Made in liver.

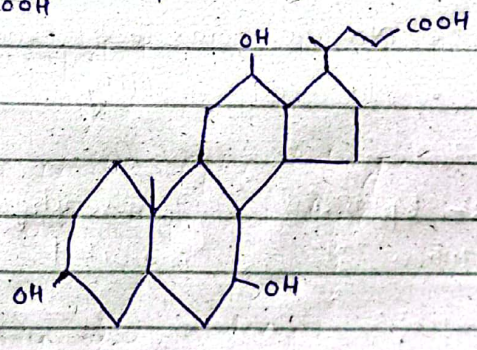
3 & 4 → Secondary " " → Made in liver & intestine

Cholic Acid → Deoxycholic Acid

Chenodeoxycholic Acid → Litho cholic Acid.



(Cholic Acid)

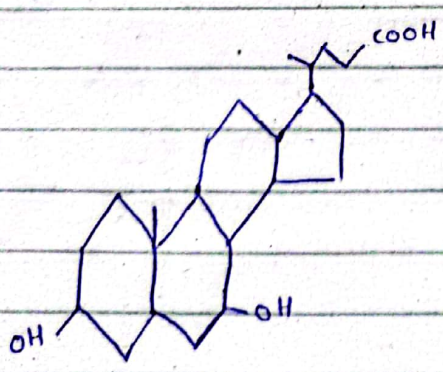


(Chenodeoxycholic Acid)

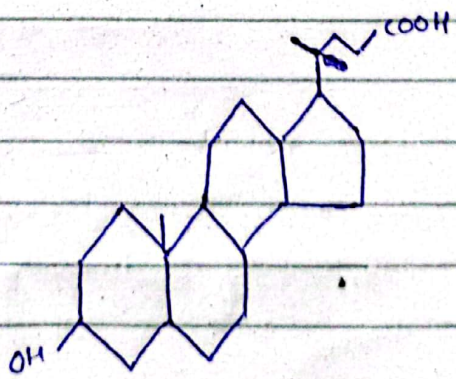
FROM CHOLIC ACID:-

Remove -OH from Carbon-12 → Chenodeoxycholic Acid.

Remove -OH from Carbon-07 → Deoxycholic Acid



(Deoxycholic Acid).



(Lithocholic Acid)

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* Each Bile Acid form 02 salts With Glycine & Taurine

Amino Acid — Amine

$NH_2 - CH_2 - COOH$ $NH_2 - CH_2 - CH_2 - SO_3H$

- Glycine + Cholic Acid ⟶ Glycocholic Acid

When Amine and Carboxyl group reacts it results Amide.

$NH_2 +$ [redacted] $COOH \longrightarrow$ [redacted] $C(=O) - NH_2 + H_2O$

compound (cholic Acid) — compound (cholic Acid) — (Glycocholic Acid)

- Taurine + cholic Acid ⟶ Taurocholic Acid.

Bile Production:-

600 mg/day from cholesterol.

Bile undergoes Enterohepato Circulation.

Liver ⟶ Gall Bladder ⟶ Duodenum ⟶ Large intestine

Hepatic Portal Vein ⟵ Mesenteric Vein ⟵ Blood

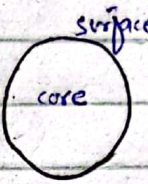
- 100% not recycle.
- 90-90% recycle
- 20-10% part of stool

Uses of Bile:-

(1) * Emulsification → B/c Anionic salt of acts as Emulsifying Agent.

Cholic Acid contain 3-OH Group and 17-Carbon Nucleus.

Non-polar So it have both Polar & Non-polar Group and known as Surfactants. & having ability to form Micells (aggregate)



micells.

core :- Hydrophobic (Fats)

surface :- Hydrophilic.

Phobicity depends upon medium of intestine which is water. Enzyme present in intestine which reach to the micelles (Lipase) and react on fat to convert it into Glycerol and Fatty Acid.

- Biles form Aggregate.
- Lipase break it.

(2)* Bile is Pharmacologically important in Biliary ~~emilini~~ Elimination:

- Major Route of Drug Excretion After kidney.
  For Lipophilic drugs and High molecular weight drugs.
  And these drugs may also undergo Enterohepatic circulation.

(3) * Bilirubin goes from bile to stool

Urine color b/c of Bilirubin ⟶ Urobilin

Stool — — — — ⟶ Stercobilin

Gall Stones :- form b/c of

1. If Bile not moving or slow moving ⟶ Cholestasis
2. If too much cholestrol presents in bile.

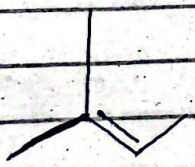
Volatile Oils

- Derivatives of Hydrocarbon, Terpenes which have volatility at room temp / Ambient temp. ——— Volatile Oils
- They are also known as essential oils
  - B/c they have essence (خوشبو)
- They are present in various part of plants such as Blundular Hair, Parenchyma cell, Oil glands, Mesophyll. Sub-epidermal tissue.
  - Oil glands → Vittae
- They usually occur in combination with other secondary metabolites such as Gums and Resin
  - Volatile Oil + Resins ⟶ Oleoresins
    - Present in Ginger, Capsicum.
  - V.Oil + Gum + Resins ⟶ Oleogum resin
    - Present in Asafoetida.
- All the volatile oils have similar uses such as they are Condiment, Flavouring Agent, Carminative, Perfumery.

Biosynthesis :- 02 biosynthetic pathway → Oil mades which contain
1. Acetic Acid-Mevalonic acid pathway → Hydrocarbon
2. Shikimic " – Phenyl propanoid " → Aromatic Oil

In Human Pathway No.1 Block by Statins.

All of the volatile oil made from isoprene unit (5-Carbon)



isopentene / isoprene

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Physical Properties Of Volatile

1. They have characteristic odour
2. They have high Refractive indices
3. They are optically active
4. They are lighter than water
5. They are coloured as well as colorless

Difference between Fixed And Volatile Oil

Fixed Oils	Volatile Oils.
1) Basic building block is not isoprene	1) Made from basic building block isoprene unit
2) Esters of unsaturated FA with Glycerol	2) Not Esters.
3) Not evaporate	3) Have tendency to evaporate at room Temp.
4) Not	4) Have odour
5) Can be saponified	5) Cannot
6) Have tendency to undergo Rancidity	6) Non rancidity
7) Not used.	7) Use in Aroma theraphy
8) Generally they are found in seed of plant	8) Can be present in leaves, Flowers, Peels

Methods Of Preparation Of Volatile Oils

1. Distillation → Simple
   → Steam (Use for Heat labile substances)
2. Expression
3. Solvent Extraction
4. Enfleurage method

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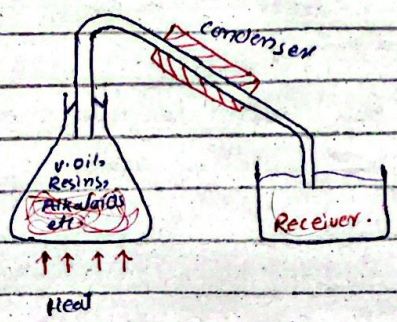
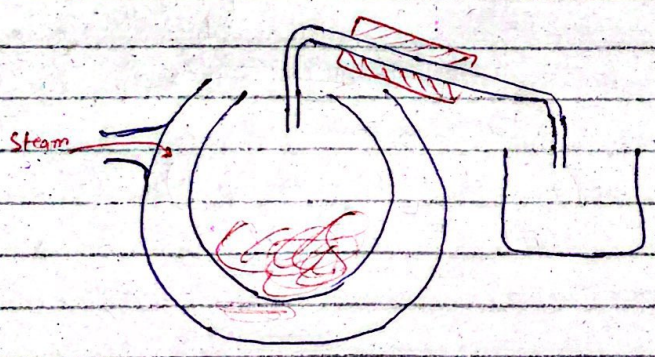
1. Distillation :- Separation of contents of mixture on the basis of B.P.



Simple Distillation

- Volatile Oil first receives in Receiver flask.
- Condenser contain cold water (7/8/9°C)



Steam Distillation.

- Jacketed containe (Double walled)
- Steams usually applied in ↑ b/w walls.
- No direct contant of plant with steam so no distruction occur.

Use for:
- Peppermint
- Spearmint
- Clove

2. Expression :- Pressing something (نچوڑنا)
- Roller mills are used

Extraction used to take v. oils from peels

Bitter Orange, Orange, Lemon

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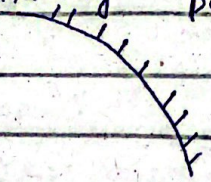
A machine having pointing projection is used.



The peels press by that machine. So the oil gland burst and oil exudes out

3. Solvent Extraction :-

Any part (Fruit / leaves / Flower)

↓

Crushed → Put in pure solvent

↓

wait for few days

↓

Filters it ← Evaporate

at Room Temp

(Rotary Evaporators used)

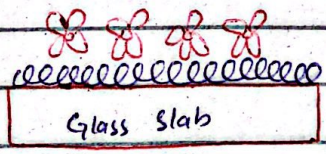
Reduce P So B.P ↓

4. Enfleurage

Use for Highly Hydrophobic and ~~Polars~~ Delicate parts

+

Flowers.



* Hydrophobic oil goes into fat and fats color changes and become saturated. Remove the old and place a new fat.

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Classification of Volatile Oils

1. Hydrocarbon V.O :-
   1. Terpentine oil
   2. Cubeb

Alcoholic V.O :-
1. Peppermint پودینہ
2. Coriander دھنیا
3. Cardamom الائچی

Aldehyde V.O :-
1. Bell-er orange peel
2. Sweet " "
3. Lemon
4. Cinnamon

Ketone V.O :-
1. Camphor کافور
2. Spearmint
3. Caraway زیرہ
4. Buchu

Phenol V.O :-
1. Laung / Clove
2. Thyme

Phenolic Ether V.O :-
1. Fennel سونف
2. Anise
3. Nutmeg / Myristica

Oxide V.O :-
1. Eucalyptus
2. Chenopodium

Ester V.O :-
1. Rosemary

Missaleneous V.O :-
1. Allium — Garlic
2. Anethum

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Coriander

Synonym:- Dhaniya (Hindi)
Fructus coriander

B.O :- Coriandrum sativum

Family:- Umbilliferae

Part used:- Dried ripened fruit

Chemical Constituent:- Alcoholic Volatile Oils 1%

- Linalool
- α- pinene
- Borneol
- P-cymene

(Linalool)

Uses:-

- Carminative
- Flavouring Agent
- Condiment
- Anti-spasmotic.

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Fennel :-

Synonym :- Saunf

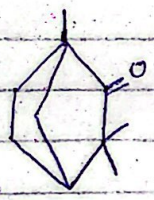
B.O :- Foeniculum vulgare

Family :- Umbilliferae

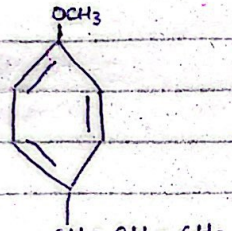
Part used :- Dried ripe fruit.

Chemical Constituent :- Volatile Oil (2-6%)

- Fenchone (20%)
- Anethole (50%)



(Fenchone)



(Anethole)

Use :-

(Same as previous)

- Digestive Aid
- Stimulant

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Cinnamon

Synonym :- Darchini

B.O :- Cinnamomum zeylanicum

Cinnamomum loureirii

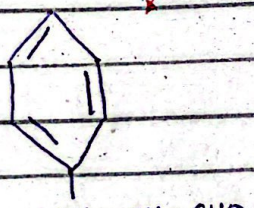
Family :- Lauraceae

Part used :- Dried bark

Chemical constituents :- * Volatile Oil 1–6%

- Cinnamaldehyde (65–70%)
- Eugenol (4%)

* Tannins



Uses :-

(Same as Coriander)

- Anti-septic (Due to tannins)
- Expectorant

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Lemon Peel :-

Synonym :- Fructus Limoni

B.O :- Citrus limon

Family :- Rutaceae

Part used :- Dried peel of fruit

C. Constituents :- * Aldehyde V.O (2–3%)

↓

Limonene (90%)

* Vitamin-C
* Flavenoids

↓

Hespiridine

Use :-

- Carminative
- Flavouring Agent
- Mosquito repellent
- In cosmetics → citrus fruits used for Bleeching.

(Limonene)

Scanned with CamScanner

Bitter Orange Peel :-

Synonym :- Fructus aurantii

B.O :- Citrus aurantium var. amara

Family :- Rutaceae

Part used :- Dried peel / rind of the fruit

Chemical Constituents :-

* Aldehyde V.O (1-3%)
  - Limonene
  - Citral
  - Citronellal
* Vitamin - C
* Flavenoids
  - Naringin
  - Hespiridine

Uses :-

- Stomachic
- Carminative
- Flavourant

Scanned with CamScanner

Sweet Orange Peel

Synonym:- Fructus aurantii

B.O :- Citrus aurantium var. sinensis

Family:- Rutaceae

Part used:- Dried Peel of fruit

Chemical constituents:-

* Volatile oils (1-3%)
  (Same ↓ as previous)
  - Limonene (80-90%)
  - Citral
  - Linalool
* Vitamin-C

Uses:

- Carminative
- Flavourant
- Stomachic
- Facial care Product — Management of Acne vulgaris

Scanned with CamScanner

Camphor :-

Synonym :- Gum camphor, 2-Camphomane

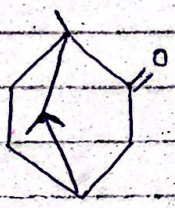
B.O :- Cinnamomum camphora

Family :- Lauraceae

Part used :- Dried woody parts (Stem & Bark)

Chemical constituent :- * Volatile oil

Solid at room temp. and it have smell b/c of sublimation. i.e Solid ⟶ Vapours.



(10-C Atom)

- Camphor
- Camphene
- Pinene
- Limonene

Uses :-

(Same as of Volatile oils)

- Insect Repellent (Pesticides)
- Rubifacient
- Counter irritant
- ~~Pesticides~~ It was part of Embalbing Fluids

مصر والے جو ممی بناتے ہیں اس پٹیوں پر کافور ڈالتے ہیں تاکہ صفراء اس تک نہ پہنچے۔

Scanned with CamScanner

Folia means leaves.

Buchu

Synonym :- Folia buchu

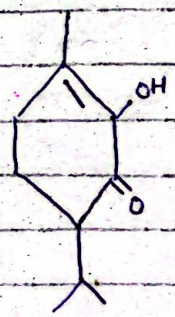
B.O :- Barosma betulina

Family :- Rutaceae

Part used :- Dried leaves

Chemical Constituents :- * Volatile oils 5-7%

- Camphor
- Diosphenol



* Flavenoids
  - Diosmin
* Mucilage
* Resins

(10-C Atoms
2-Isoprene Atoms)

Uses :-

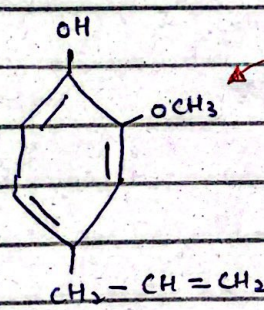
- Urinary Anti-septic
- Diuretic
- इसे Same as of U.O without Flavorant

Father of Taxanomy = Carlous Linnius. Phenolic derivative = Anti-septic.

Clove (Exam imp)

Synonym :- Laung, Syzygium aromaticum
B.O :- Eugenia caryophyllus
Family :- Myrtaceae
Part used :- Flower bud

Chemical Constituent :- * Volatile oils (5-10%)



(Phenolic derivative)

- Eugenol (85-90%)
* Tannins (14-20%)
Triterpenoid derivatives (10-13%)

Use :- Phenolic der.

- Anti-septic (~~Anti-septic~~)
  - ↳ Phenol leaves a stain of brown colour so we make phenol derivatives such as Dettol etc which can't leaves the stain.
- Tooth Ache. Not in any other place instead of tooth
  - ↳ Because it has local Anesthetic Action
  - ↳ Desensitize the expose nerve endings.
  - ↳ gts also b/c of type of pain Tooth pain is localized and other pain are not localized They are dulled (overall). Tooth fibres send shap signals.

Tooth fibres Exposed
All other " Not exposed.

Scanned with CamScanner

• Ice is mode of Ephedrine (Hypertensive)

Nutmeg :-

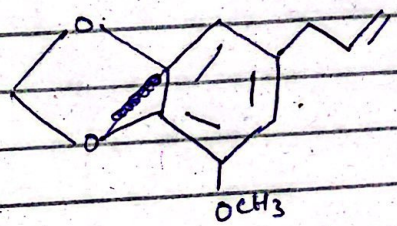
Synonym :- Jaiphal (جائفل)
B.O :- Myristica fragrans
Family :- Myristicaceae
Part used :- Dried Arills & Mace of seed

C. Constituents :-
* V. Oil (5-10 %.)
  - Myristicin → Auditory & Visual Hallucination
  - Elemicin
  - Isoelemicin
* Fat (Nutmeg butter) (30-40%.)
* Starch
* Coloring Pigment

Toxic in higher quantity. CNS Stimulant & they Rxn like Amphetamine.

Uses :-
• Same as of volatile oils.

• Ice is D/C of Blood Pressure. / Stroke.
When B.P Yes in Brain the Brainpart touch the cranium and that part of Brain died.



ضروری نہیں ہے۔

(11-C Atom myristicin)

Scanned with CamScanner

Eucalyptus :-

Synonym :- Gum wood oil, Gum tree oil

B.O :- Eucalyptus globulus

Eucalyptus australiana

Family :- Myrtaceae

Part used :- Dried leaves

C. Constituents :- * Volatile oils (3–6%)

- Eucalyptol (80–90%)
  Or Cineole

(10-C Atom)

* Resins
* Tannic Acid
* Flavenoids

Use :-

1. Eucalyptol is Anti-septic and is presents in mouth washes b/c of its coolness.
2. Insect Repellent
3. Rubafacient & Counter irritant
4. Carminative
5. Flavourant

Scanned with CamScanner

Chenopodium :-

Synonym :- American wormseed oil Ambrosia oil

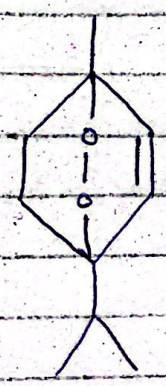
B.O :- Chenopodium ambrosiodes

Family :- Chenopodiaceae

Part used :- Dried Aerial parts (leaves, stem, Flowering tops twigs [Branches])

C. Constituents :- Volatile oil (1-4%)

- Ascaridol (70%)
- Limonene
- p-cymene
- Camphor



(Per-oxide Bond)

(10- C Atom)

Use :-

1. Anthelmintic (Against worms) Veterinary use special Round And Hook worms
2. Amebiasis

Scanned with CamScanner

Cardamom :-

Synonym :- Elaichi, Grains of Paradise

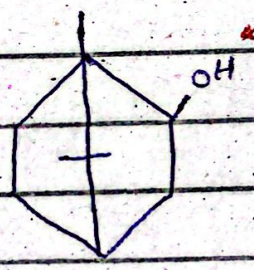
B.O :- Elettaria cardamomum

Family :- Zingiberaceae

Part used :- Fruit and Seed.

C. Constituents :- * Volatile oil (3-8%)

- Cineole } (70%)
- Borneol }
- Sabinene
- Terpineol
- Limonene



* Fixed oil
* Starch

Uses :-

(Same as of volatile oils)

1. Herbal tea preparation.

Scanned with CamScanner

Garlic :-

Synonym :- Lehsan

B.O :- Allium sativum

Family :- Liliaceae

Part used :- Dried Bulb

C. Constituents :- * Volatile oil (upto 0.2%)

- Sulfer containing.
- They are irritant so when they touch when Sclera of Eye. irritation start & Protective Reflexes i.e tears start.

- Allicin
- Alliin
- Allyl propyl disulfide
- Diallyl disulfide.

* Amino Acid

- Methionine
- Cysteine
- Leucine
- Valine

Uses :-

1. Condiment
2. Carminative
3. Anti-Hypertensive

Scanned with CamScanner

Turpentine Oil :-

Synonym :- Rectified oil of terpentine.

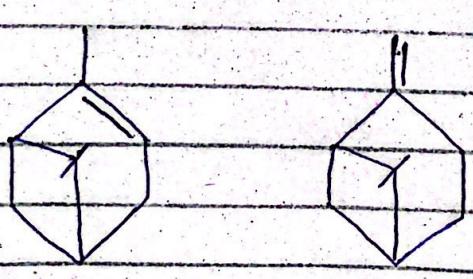
B.O :- Pinus palustris
Pinus longifolia

Family :- Pinaceae

Part used :- Turpentine oil.
It is obtained from oleoresin present in the Bark Or trunk of tree by Distillation.

C. Constituents :- Volatile oil (7- 10%)

Major →
- α-pinene (30%)
- β-pinene (10%)
- Phellandrene
- Limonene
- Camphene
- P-cymene



Use :-

1. Rubifacient
2. Counter Irritant
3. Formulation of Paints And Varnishes (Polishes)

Scanned with CamScanner

Caraway :-

Synonym :- Fructus carvi ۔ زیرہ

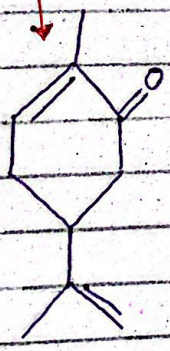
B.O :- Carum carvi

Family :- Umbelliferae

Part used :- Dried fruit (ripened)

Chemical Constituents :-

* Volatile oils (2-7 %.)
  - Anethole (50-60%.)
  - Fenchone (~20%.)
  - Carvone (50-60%.)
  - Dihydrocarvone
  - Limonene
  - Carveol
  - Dihydrocarvacrol
* Fixed Oils (12%.)



Fruits کو Family اس
Cremocarp کہتے ہیں۔
Fruits کے چھلکے کے نیچے گودے
کو Mesocarp کہتے ہیں۔
Family اس کے Fruit دو
برابر حصوں میں تقسیم ہوتے
ہیں۔ Shizocarp۔
Shizocarp کو Longitudinal
لمبے ہو سکتے ہیں اور Rigid
Cremocarp ہے
اور Shizocarp کے ایک حصے کو
Mericarp کہتے ہیں۔

Uses :-

Same as of volatile oils.

Scanned with CamScanner

Dill :-

Synonym :- Fructus Anethi

B.O :- Anethum gravedens

Family :- Umbelliferae

Part used :- Dried ripened Fruit

Chemical Constituents :- Volatile oils (2–6%)

(Major V.O)

- Carvone (20–45%).
- Dihydrocarvone
- Dillapiol (15%)
- Phellandrene
- Terpinene

Uses :-

Same as of volatile oils

Scanned with CamScanner

Anise :-

Synonym :- Fructus Anisi

B.O :- Pimpinella anisum

Family :- Umbilliferae

Part used :- Dried ripe fruit

Chemical Constituents :- * Volatile Oil (1-4%)

- Anethole (90%)
- Chavicol
- Methyl chavicol

* Proteins & starch.

Uses :-

Same as of V.O

Scanned with CamScanner

Thyme :-

Synonym :- Folia thymus

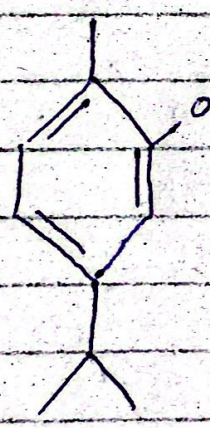
B.O :- Thymus vulgaris

Thymus zygis

Family :- Labiatae / Lamiaceae

Part used :- Dried leaves & Flowering tops, Aerial portion.

Chemical Constituents :- Volatile oil (At least 1.2%)



- Thymol (35–55%)
- Carvacrol
- P-cymene
- Terpinene

Uses :-

- Antiseptic / Antibacterial (Thymol)
  Disinfectant
- Same as of U.O.

Scanned with CamScanner

Rosemary :-

Synonym:- No Synonym OR Oil of Rosemary

B.O :- Rosemarinus officinalis

Family :- Labiatae Lamiaceae

Part used :- Leaves & Flowering tops

Chemical Constituent :- * Volatile oil (1-2%)

- Cineole / Eucalyptol
- Borneol
- Camphor

* Saturated Aliphatic Hydrocarbons.

Uses :-

Same as of V.O

Scanned with CamScanner

Cubeb :-

Synonym :- Tailed pepper کباب چینی

B.C :- Piper cubeba

Family :- Piperaceae

Part used :- Dried Ripe seeds

Chemical Constituents :- Volatile oils (15%)

- Cubebene
- Cubebin
- Cineole
- Sabinene (50%)
- Camphor

Use :-

(Same as of V.O.)

- Carminative
- Flavorant
- Condiment
- Upper Respiratory Tract Infections.

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Lipids

1. Oils;
   1. Caster oil
   2. Cotton seed oil
   3. Olive oil
   4. Peanut oil
   5. Sunflower oil
   6. Corn oil
   7. Coconut oil
   8. Almond oil
   9. Linseed oil
   10. Mustard oil
   11. Sesame oil
   12. Soyabeen oil

2. Fats;
   Cocoa Butter
   Limoline.

3. Waxes;
   Beeswax
   Carnuba wax
   Spermaceti
   Jojoba oil (imp)
   (جوجوبا)

Lipids;

Def:- These are heterogeneous group of organic compounds that are soluble in non-polar solvents

Classification of lipids;

1. Simple Lipids ⟶ i- Fats ii- Oil iii-Waxes
2. Compand Lipids ⟶ i-Phospholipids ii-Glycolipids
3. Derived Lipids ii-Sphingolipids iii-Cerebrosides
   - i- Steroids ii- Sterols
   - iii- Carotenoids iv- Fat soluble vitamins.

Simple lipids:-

Def:- Esters of FA with Alcohol.
(Trihydric) Glycerol ⟶ in case of Fats & Oil
Monohydric Alcohol ⟶ in case of waxes

Fats and Oil ⟶ Triglyceride
(acyl)
Also called Triglycerol, Neutral Lipid.

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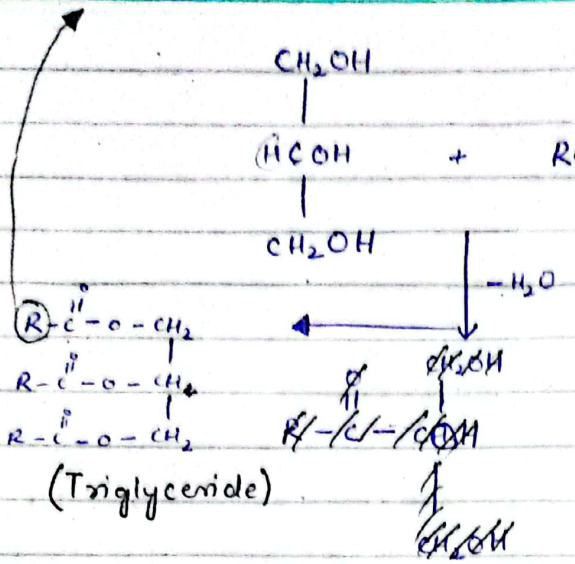
Oils → Unsaturated

Fats → Saturated



(Triglyceride)

Example of:-

Saturated FA :- Palmitic Acid (C-16)
Stearic Acid (C-18)
Lauric Acid (C-12)
Myristic Acid (C-14)

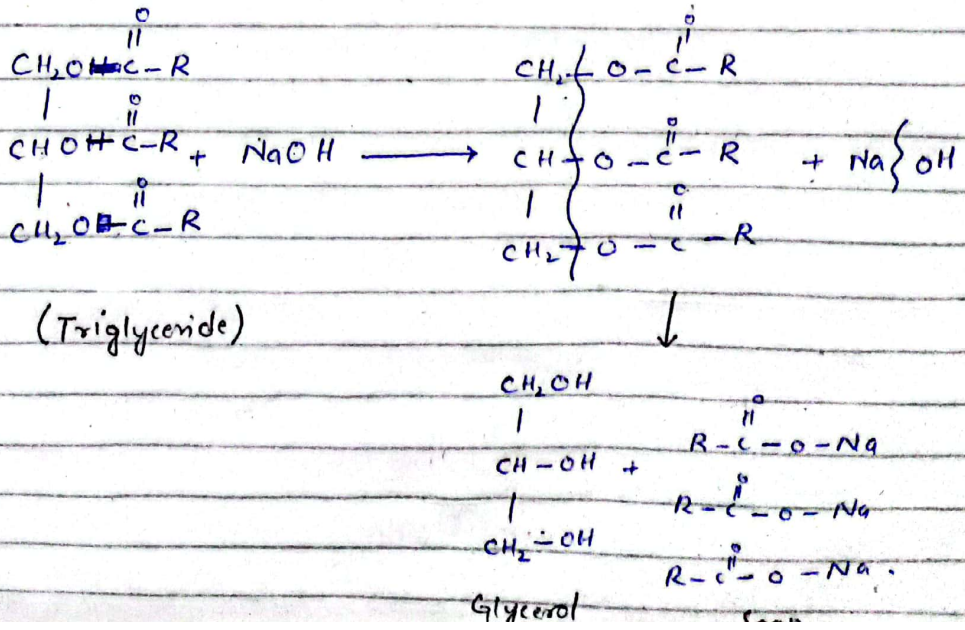
$CH_3-(CH_2)_{14}-COOH$ Palmitic Acid.

$CH_3-(CH_2)_{16}-COOH$ Stearic Acid

$CH_3-(CH_2)_{10}-COOH$ Lauric Acid

$CH_3-(CH_2)_{12}-COOH$ Myristic Acid.

Saponification:-



(Triglyceride)

Glycerol

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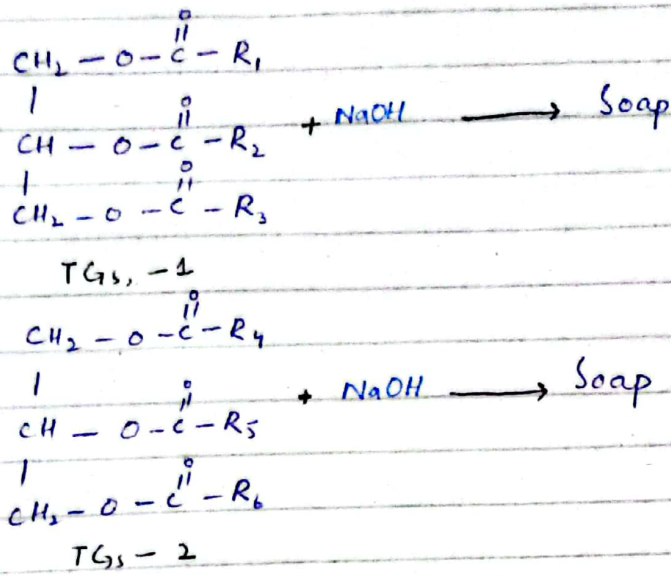
Saponification Number :- The no. of mg of KOH required To saponify 01 gm of Fat./ Oil.



TGs, - 1

TGs - 2

Suppose R_1, R_2, R_3 → Stearic Acid

And R_4, R_5, R_6 → Lauric Acid

If both react with NaOH it will form soap.

Suppose both TG's have same 10g but the saponification no. of Lauric Acid is greater than Stearic Acid b/c of Carbon No. of Lauric Acid is less than it but its weight i.e. 10g equal to that of Stearic acid which means that it has greater no. of molecules so it have greater Saponification No.

$$\text{Carbon chain length} \propto \frac{1}{\text{Saponification No.}}$$

Iodine Number :- The no. of gm of iodine required to react completely and saturate 100gm of oil.

- It gives us degree of unsaturation.

Iodine No. ∝ Unsaturation ∝ Double Bond.

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- PUFAs (Poly unsaturated FA) is nutritionally high important because of greater iodine No.
  ↳ It is found in Fish oil (مچھلی کا تیل)

- Greater iodine No. ⟶ Unstable.

  Iodine No. ∝ Unstable ∝ Autooxidation.

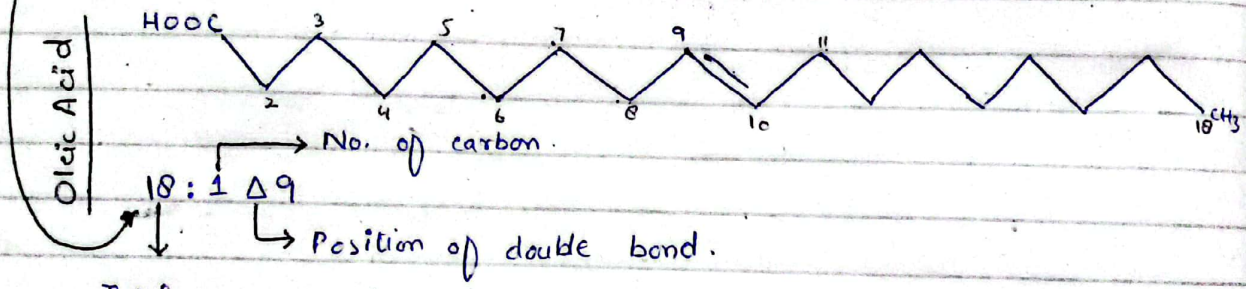
Unsaturated FA :-

1. Oleic Acid
2. Linoleic Acid

Naming of Unsaturated FA :- By 02 ways

1. Delta System
2. Omega System

1. DELTA SYSTEM;

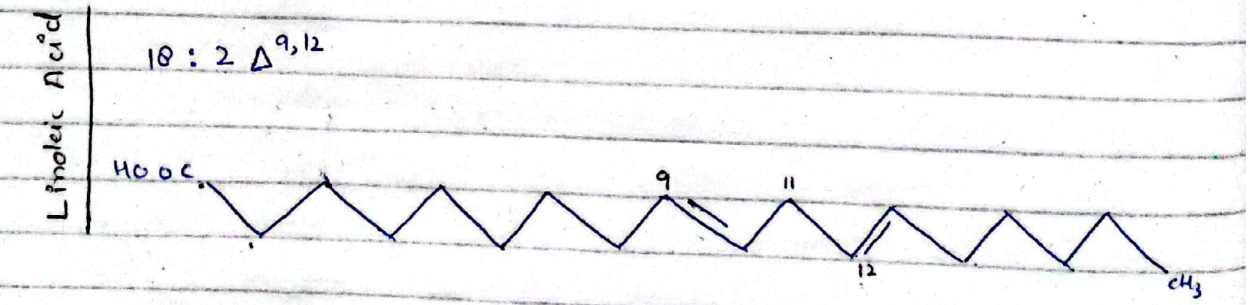


No. of carbon.

18 : 1 Δ9

↳ Position of double bond.

Total no. of carbon



2. OMEGA SYSTEM :-

Counting start from Aliphatic chain end not Functional Group Carbon.

First double bond comes on Carbon No. 6 of linoleic Acid so it is ω-6 FA.

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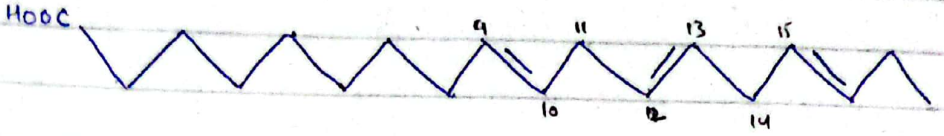
→ Very Good Anti-oxidant. • یہ PUFAs لوگ اس لئے پیتے ہیں کیونکہ یہ

Linolenic Acid

$18:3\ \Delta^{9,12,15}$



Omega(ω)-3 FA

Eicosanoids made from PUFA's in our body.

PG ← Arachidonic Acid.

Castor Oil

Synonym:- Arind

B. Name:- Ricinus communis

Family:- Euphorbiaceae

How to Produce?

Seeds → Hot pressing / cold pressing → Filter

Seed cake → ~~Antigen~~ Very toxic

Oil → Refining

Chemical Constituents:- Fixed oils (30-50%.)

↓

Castor oil

↳ Its triglyceride is triricinoleate. (80-90%.)

Also present;

- Oleic Acid Esters
- Linoleic " "

Ricin present in its seed cake — Toxic.

Ricinoleic Acid = 12-OH Oleic Acid

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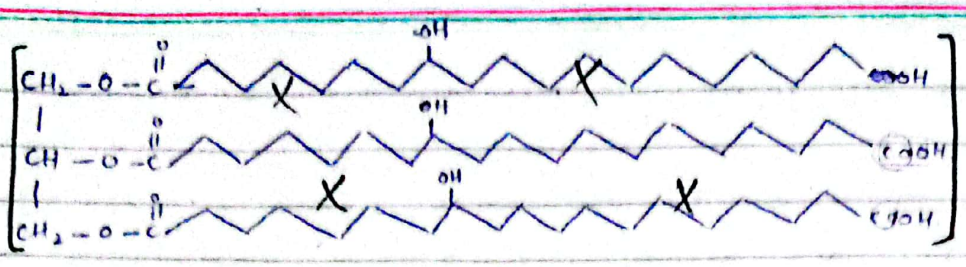

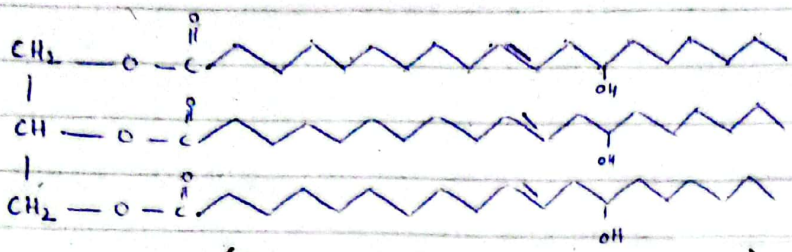

(Triglyceride of Ricinoleic Acid)

Ricin Actions;

- Ricin is inhibiter of self protein synthesis
- It also inhibit cellular transport mechanisim.

- Seed toxicity occur when crushed

Use of Caster Oil:-

1) Constipation. → Ricinoleic Acid. in the form of Triricinoleate
   ↳ It is irritant / Stimulant Purgative, Due to this stools become watery
   - If forms soft stool = Laxatives
   - If form watery stool = Cathartic.

* Triricindeate —(lipase, in small intestine)→ Free Ricinoleic Acid
  ↓
  It cause sensitization of nerve ending in large intestine which leads to strong muscular contraction → Too much water loss → Painful.

* Ricinoleic Acid → Absorb to blood → Goes to muscular layer of GIT → Activate / Stimulate EP_3 Receptor → Muscular contraction.

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EP3 ® famous for uterus not Constipation.

* EP_3 ® Also present in uterus ⟶ Ricinoleic Acid from Blood
Harmful ⟵ contract uterus ⟵ Goes to uterus
in pregnancy, can lead to Abortion.

* PG Also Ad on EP_3 ® to contract uterus.

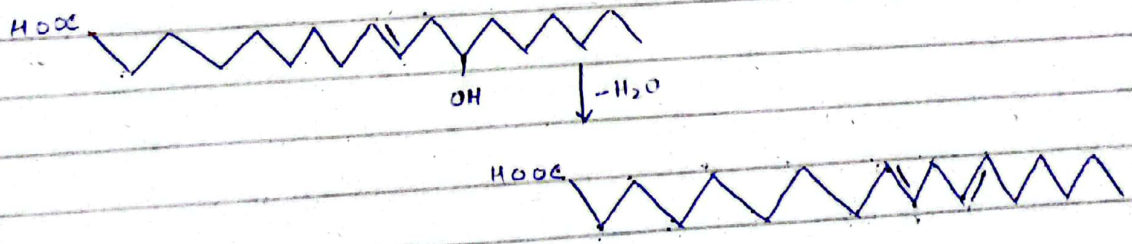
2) Cosmetics
↳ It is very Shiny.

3) Tablet coating
↳ For polishing and shining.

4) Vehicle in certan I/M injection.

5) Explode as biodiesel

6) Ricinoleic Acid $\xrightarrow[-H_2O]{\text{Dehydration.}}$ Linoleic Acid



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Olive oil :- زیتون

Synonym:- Sweet oil, Salad oil
B.Name:- Olea europea
Family :- Oleaceae
Indeginous to :- Palestine (originally)
Biggest Producer :- Spain, Greece & France.
Qunisia in Arab countries.

- Olive oil tree is ever green and fruited in winter

Part used :- Fruit

How to obtained ?

Fruit grinded ⟶ Press it ⟶ Oil Separated called Virgin Olive oil and purest High Quality oil.

Add hot water to the pressed cake, wait and pressed again ⟶ Oil Separated and that oil is Edible oil (کھانے والا تیل)

When the pulp of fruit is also present in the oil then it is third class oil.

Constituents :-

- Esters of Oleic Acid (56-85 %) → Highest Quality of monounsaturated FA.
- " " Lindeic " (20 % تک) → Rich in Polyunsaturated FA
- " " Palmitic " (10 %.) → Saturated FA
- Lignosaric Acid (Esters of)
- Arachidic Acid (" ")

زیتون میں بھی کچھ تیل جم جاتے ہیں تیرنے ان میں Saturated FA ہوتے ہیں۔
زیتون کا تیل بھی بعض اوقات جم جاتے ہیں۔

Uses :-

1) Soap manufacturing
2) As lubricant
3) In formulation of liniments

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4) In the preparation of plasters
5) It has Emolient, Laxative & Choleretic properties
↑es Bile flow

6) Cooking
7) Salad

Peanut Oil

Synonym:- Arachis oil, Ground nut oil
B. Name:- Arachis hypogea
Family:- Leguminosea
Part used:- Seeds

How to Obtained:-
Cold expression → Filter → Refining → Decolorize.

Constituents:-
- Esters of Oleic Acid (46%)
- Esters " Linoleic " (30%)
- " " Palmitic Acid (7-20%)
- Arachidic Acid (Esters of)
- Lignosaric " (" ")
- Stearic " (" ")

Uses:-
- Have high smoke point
  ↳ smoke point ∝ Frying (تلنا)
- Good solvent in Cosmetics
- Arachis oil → Parenteral preparations usage.
- Oily injections.
- Ingredient of camphorated oil.

Peanut Allergies:- Common with this oil.
If peanut oil Refine → No Allergens
مگر بغیر ہی استعمال نہیں کرنا چاہیے۔

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Soybean oil:-

Synonym :- Soyabean oil
B. Name :- Glycine max
Family :- Leguminosae
Part used :- Seeds

How to Obtained:

Seeds are crock → Heat (60-80°c) → Organic Solvent extraction

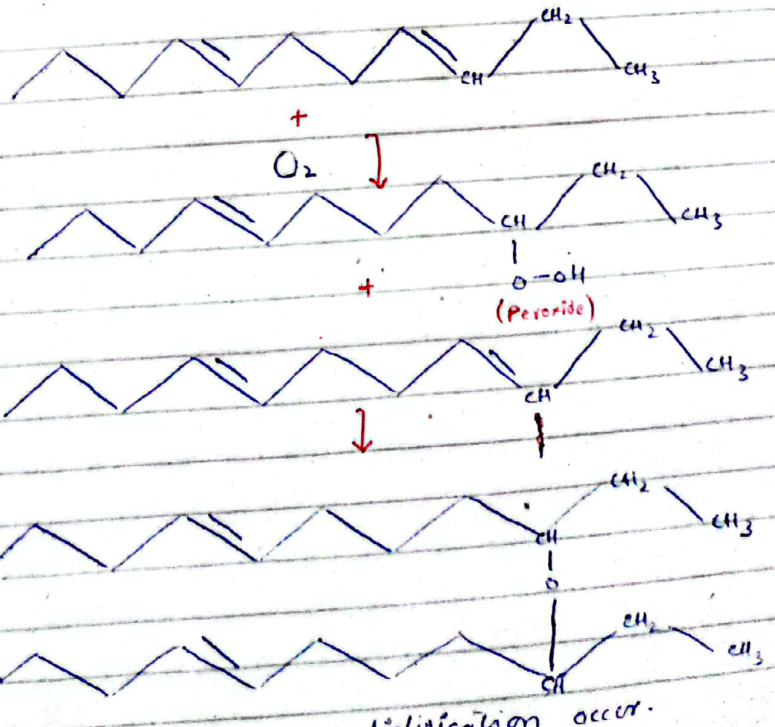
Refining (useable oil separated) ← Filter (Crude oil Separated)

Seed cake → Animal feed

* Soybean is type of Drying Oil:-

After exposure to air it solidify. and make a layer on surface it b/c of chemical reaction with oxygen of air.

Drying oils have tendency to react with oxygen of air.



Chain reaction started & solidification occur.

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- Oil Have Polyunsalvraled FA ⟶ Make more drying oils
- Oil Have monounsalvraled FA ⟶ Not make — —

* Hydrogenated Soybean oil also present to decrease solidification

Use :-

Drying oil used in paints, wamishes, polishes.

Constituents :-

- Oils (30 – 40 %)

~~Polyunsatu~~

* On average it contains ;
  - Polyunsalvraled FA Esters (57 %)
  - mono — — — (20 – 25 %)
  - Salvraled " " (15 %)

* Fatty Acids
  - Linoleic Acid (51 %)
  - Linolenic " (10 %)
  - Oleic Acid (20 – 25 %)
  - Palmitic Acid (10 %)
  - Stearic Acid (4-5)

Uses of Soybean Oil:-

- In paint, wamishes.
- Cooking
- Salad dressing
- Soap manufacturing
- Total parenteral nutrition as lipid.
  ↳ Lipofundin ⟶ Soybean oil Emulsion.
- Use as fixative in natural Insect Repellent formulation.
  e.g For lemon oil Or Geranium oil.

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Sesame oil :- (ज.)

Synonym :- Teel oil, Gingelly oil
B.T Name :- Sesamum indicum
Family :- Pedaliaceae
Part used :- Seeds

How to Obtained ?

Cold expression → Filter → Refine

Constituent :-

* Oils (50%)
  - Esters of oleic Acid } majorly present :
  - " Linoleic "

* Sesamin
* Sesamolin
* Sesaminol

→ Lignans present in its oil not seed.
- Anti-oxidant
- Les blood cholestrol

Use :-

1) Cooking
2) Salad
3) Soap manufacturing
4) Anti-oxidant
5) Les cholestrol level.

* Iodine No. of its Greater than Olive Oil So it has more unsaturation.

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Sunflower Oil :-

Synonym :- سورج مکھی کا تیل

B. Name :- Helianthus annuum

Family :- Compositae (Asteraceae)

اس میں کانٹے زیادہ ہوتے ہیں

Part used :- Seeds

How to Obtained :-

Seeds

Cold expression | Solvent Extraction

Refining.

Refined Sunflower Oil

1) Less free FA.
2) Stable.

Unrefined Sunflower oil

1) More free FA so they
2) are unstable and change into transfat
   - Yes Blood cholesterol level
   - Stable.

Biggest Producers :

Russia and Ukraine

* Sunflower oil is replaced nowadays by Rapseed oil b/c one of the biggest producer Ukraine not producing

Constituents :-

* Oils (30 — 40%)

ON AVERAGE :-

- Esters of Linoleic Acid (59%) omega-6
- — — Oleic — (30%) omega-9

Saturated
- — — Stearic — (06%)
- — — Palmitic — (05%)

* Vitamin-E (41 — 45 mg / 100 gm oil)

It is drying oil.

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* Russia used to produce hybrids.

03 - Industrial grades of Sunflower oil.

High linoleic Acid Grade (upto 70%.)
High oleic Acid Grade. (upto 80%.)
High Stearic Acid Grade. (upto 18%.)

Use :-

1) Cooking
2) Salad
3) Soap manufacturing
4) Seed cake is rich in fibres and proteins so it is good animal food and fertilizer as well.
5) Emolient
6) Cosmetics ⟶ Ezzema.
   ↳ Pegylation of FA occurs
   ↓
   Addition of PEG
   • When Pegylation occur it results into prolonged Active. b/c it escapes the immune system and present in blood for long time.

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Corn oil

Synonym :- Maize oil

B.Name :- Zea mays

Family :- Gramineae (Poaceae)

Part used :- Embryo present in seed

Worldwide production.

How to Obtained?

Cold expression ⟶ Refining

Constituent :-

* Fixed oil (20 %)
  - Esters of Linoleic Acid (55–62 %)
  - — — Oleic — (24–33 %)
  - — — Palmitic — (8–13 %)
  - — — Stearic — (1–4 %)
  - — — Linolenic — (1.5 %)
* Phytosterols
  - β-sitosterol
* Unsaponifiable matter (1 %)
  - Derived lipids

Use :-

1) ↓es Blood cholesterol
   - Diabetic patient
   - Coronary ~~Heart~~ Artery Disease

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Coconut oil :-

B. Name :- Cocus mucifera

Family :- Palmae

Part used :- ~~Root~~ Fruit

Coconut milk (Emulsion) | Copra (Edible portion, Meat)

Coconut oil → Oily portion of coconut milk.

↳ M.P = 24 °C.

* How to obtained?

Grind → Boil → Hot expression

* Iodine No. = 7—11

It is very less iodine No. so it is monosaturated & Have many saturated FA. and for this reason it become solidify. and % of solidification it is known as Coconut oil

In winter → Solid

In summer → Thin, clear liquid.

* Saponification No. : High

So it have low Molecular wt. and have short chain length.

اس سے صابن بنانے میں زیادہ Chemical لگتا ہے۔

* RBD Oil = Refined Bleach Deodorized → خراب بدبو نہیں ہوتی

Unrefined = Have color & odor. → جلدی خراب ہو جاتی ہے۔

Edible oil

Constituent :-

* Fixed Oil (50%)
  - Esters of saturated FA (80%)
  - — — monoun— — (6-7%)
  - — — PUFA (1-2%)

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SDS:- Sodium dodecyl sulfate / Sodium Lauryl Sulfate

* Saturated FA:-
  - Esters of Lauric Acid (43-55%)
  - — — Myristic — (16-18%)
  - — — Stearic —
  - — — Palmitic —
  - — — Caprylic —
  - — — Capric —

* Monounsaturated FA:-
  Esters of Oleic Acid

* PUFA:-
  Traces of Linoleic Acid (بہت کم)

* Unsaponifiable matter:-
  Vitamin E = 3-5mg/100g oil
  Phytosterol = 80mg./100g oil

Use:-
- Cooking
- Salad
- Soap
- Healthy Hair
- Lauric Acid → Lauryl Alcohol
  - Use in cosmetics
  - Production of Sodium Lauryl sulfate
    - Anionic surfactant
    - Shampoo use.

$CH_3-(CH_2)_{10}-CH_2-OH$

Anti-microbial
Anti-diarrheal

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Linseed oil :-

Synonym :- Alsi (Hindi), Flax seed oil.
Its fibre is known as Flax.
B. Name :- Linum usitatissimum
Family :- Linaceae
Part used :- Seed (Ripened)
* Drying oil :- (تیل جو سوکھ جائے)
↳ When exposed to air, formed peroxide and make a layer which solidify.

Composition :-

- Esters of Linolenic Acid (52 - 56%)
- — — Oleic — (18 - 22%)
- — — Linoleic — (15 - 18%)
- — — Palmitic — (07%)
- Stearic — (3 - 5%)

PUFA :- 70%.
Monounsaturated FA :- 20%.
Saturated — :- 12% Part of cell membrane.

ω - 3 :- (03 double bond) Linolenic Acid —(in body convert into)→ Arachidonic Acid
ω - 6 :-
ω - 9 :-

Uses :-

1) Cooking
2) Salad
3) Soap
4) High Nutritional value
↳ Anti-oxidant
↳ Arachidonic Acid Synthesis
5) Paints, varnishes, Polishes — Due to Drying oil.
↳ Paint binder
↳ Paint pigment carrier.
↳ Prevent water loss.

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6) Puttin comparkment

جب لکڑی یا فرنیچر میں زخم آجائے تو پھر اس کو Fill کرنے میں اور اس کو Smooth کرنے میں یہ استعمال کیا جاتا ہے

Wall putty etc.

Linseed oil + Chalk ⟶ Putty

جگہ

چاک جگہ بھرتا ہے اور اس کو Linseed اپنا Smooth کرنے میں کردار ادا کرتا ہے۔

Mustard Oil

یہ پہلے Glycoside کے chapter میں گیا ہے۔ وہ سارا اور اس کے ساتھ یہ Oil composition لکھنی ہے۔ اور اگر Glycoside میں آئے یا Oil میں آجائے تو سارا لکھنا ہے۔

B. Name :- Brassica campestris

Family :- Cruciferae / Brassicaceae

Part used :- Seed

Composition :-

Esters of	Erusic Acid	40 – 60 %.
– –	Oleic –	20 – 22 %.
– –	Linoleic –	14 – 18 %.
– –	Linolenic –	06 – 07 %.
– –	Myristic –	10 %.
– –	Eicosenoic –	07 – 08 %.

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Beeswax

White (Fresh Beeswax is white)

Synonym :- Cera alba

From by Honey bee → Worker bees → in Honey comb

B.Z. Name :- Apis mellifera

Family :- Apidae

Natural Beeswax → White in color.

* Many Arthropodes have segmented Abdomen
  covered by scales
  called Sternites

And wax producing glands present in segmented Abdomen.

↳ 1 Honey bee have 08 wax producing glands

Producing capacity and size depends upon Age of Honey bee

Age ∝ 1/size of glands

Why wax formed?

- To make compartment to store honey.

1 kg of beeswax can store 20 – 25 kg of Honey.

European beeswax

- European Honeybees makes large No. of beeswax
- جلد turns into yellow

(Asia) Oriental beeswax

- Oriental Honeybees makes slightly small No. of beeswax
- Stay transparent

Wax :- Esters of long chain FA with long chain monohydric Alcohol (mostly).

Worker honeybees form wax in Abdomen and Regugitate from mouth. During regurgitation pollen mixes (مِنہ سے باہر نکالنا) with it.

Major Constituent :-

- Triacontanyl palmitate

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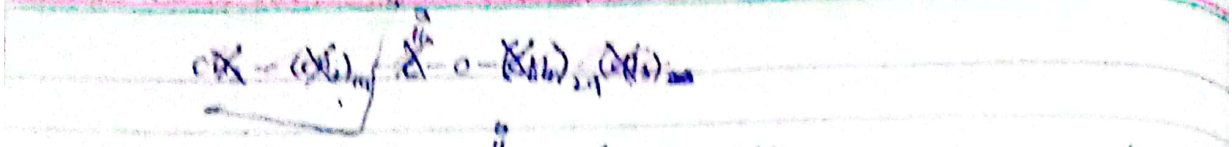
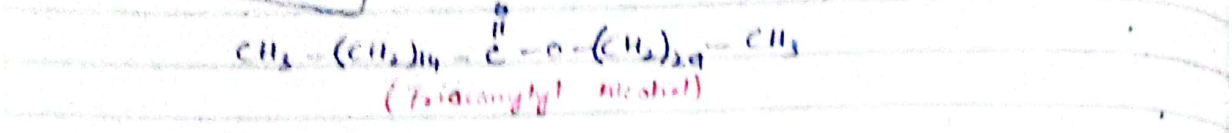
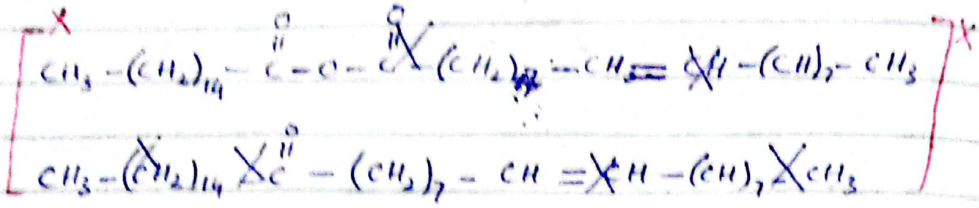
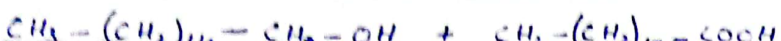




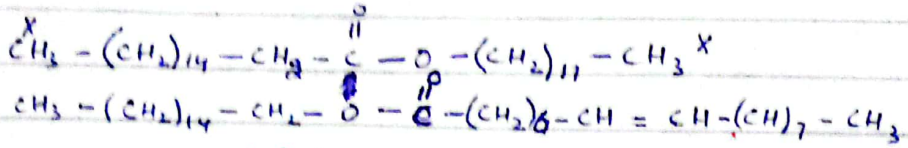
(Triacontyl alcohol)

* Palmito - oleate .



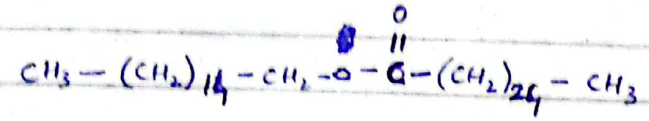


Palmito Alcohol oleate



∴ Palmito oleate

* Palmitoylcerotate.



Composition :-

Monoesters	(35 %)
Diesters	(14 %)
Hydrocarbons	(14 %)
Free Fatty Acids	(12 %)

Melting point : 60 - 62 °C

Use :- 1. Candles manufacturing
2. Painting
3. Polishing (Furniture, car)
4. Cosmetics
5. Glazing agent
   If use in food its code is E901
6. Tablet polishing

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یہ Part-A اور یہ Part-B

Carnuba wax :- Obtained from plant source.

Synonym :- Brazilian wax, wax-palm tree.

B. Name :- Copernicia prunifera

Family :- Palmae

Part used :- It is the exudate emerging from the pores of the leaves of wax-palm tree.

Colour :- Greenish

Odor :- Characteristics

Taste :- Bland (مکھن جیسے)

Composition :- It contains

Esters of Hydroxylated FA such as;

↳ Carnubic Acid.

Use :-

1) It is used in cosmetic product preparation, depilatories and deodorants.
2) It is used for tablet coating.
3) Shoe polishes
4) Automobile waxes.

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Lanolin :-

Synonym :- wool fat

It is a purified fat like substance obtained from the wool of sheep

B. Name :- Ovis aries

Family :- Bovidae

Saponification No. 90 – 105 Iodine No. = 18 – 32

Preparation :- Raw wool → Wool Grease (crude lanolin)

↓ washing

Centrifugation ← Acid treatment

↓

Bleaching

Color :- Pale yellow

Odor :- Characteristic

Taste :- Bland

Melting point :- 36 – 42°C

Soluble in :- chloroform.

* Hydrous Lanolin contain 25% water

- Its m.p is in the Range b/c it depends upon the preparation methods and Acid treatment duration.
  - ↳ Bleaching Agent conc. used = m.p → 36°C
  - ↳ Acid treatment duration ↑ = m.p → 36°C
  - ↳ If water is present more = m.p → 42°C

Composition :-

* Cholestrol & Isocholestrol in free form and esterified form.
  - Act as alcohol in Esterification.
  - Have -OH on C-3
  - Esterification of cholestrol occur with ;
    - ↳ Lanocenic Acid.
    - ↳ Lanopalmitic Acid
    - ↳ Carnubic Acid
* Ceryl Alcohol

Ceryl Alcohol

Carnubul —

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* Commercial wool fat Also contain small Quantities of:
  - BHT (Butylated Hydroxy toluene)
    - ↳ Anti-oxidant

Use :- 1) Ointment bases
2) Cosmetics usage
   - ↳ Sometime people are allergic with it.
   - ↳ Hypoallergenic lanolin — no Allergens (Lanolin)
3) Emollient
   - ↳ Make skin smooth
   - ↳ Make — Hydrated.
     Retain moisture in skin by covering surface.

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Oil and Fats are Triglyceride (TGs)

Jojoba oil :- (ho-ho-ba oil)

Synonym :- Buck nut, Goat nut, Coffee nut, Jojoba wax
B.O :- Simmondsia chinensis
Family :- Simmondsiaceae.
Part used- ~~Ripe~~ Dried seed
Indegenous to Mexico desert
Esters of FA with Glycerol
unsaturated

- Chemically its not oil, it is wax, it is not TGs.
  - Esters of long chain FA with long chain monohydric Alcohol
  - Usually monoesters.

and it is liquid b/c of unsaturation.

In its seed :- (50%) Jojoba oil
↳ Monoesters (97%)
of FA : Eicosenoic Acid
with Alcohol : Docosenyl Alcohol

- Docosenyl Eicosenoate (Ester)
  - * Eicosenyl eicosenoate
  - * Docosenyl oleate
  - * β-sitosterol
  - * Stigmasterol

Important :- People know about it in 1970. B/c in this year worldwide ban on spermwhale. When there was no hunting so there was shortage of Sperm oil and spermaceti. So Jojoba oil is substitute of Sperm oil & Spermaceti.

Uses :-

1) Spermacetic / Sperm oil Substitute
2) Sperm oil has ~~cetyl~~ cetyl Alcohol and Jojoba oil also have cetyl Alcohol
3) Emollient (moisture retain)
   ↳ they make layer over skin is very thin so uneasyness [illegible]

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↳ Composition of jojoba is similar to sebum present in skin so unoiliness not feeling.

4) Anti-acne

Acne - vulgaris form when sebum production increases in any body parts and accumulate in hair follicle pores and block it. Bacteria comes to this accumulation and multiplication start which cause inflammation and pus.

For its treatment :-

- Tablets for 03 months.
- Creams, soln. etc.

↳ Jojoba oil can dissolve sebum and open the pore of Hair follicle and oxygen in which kill these bacteria.

5) Excellent to incorporate ↳ Natural fat soluble Anti-oxidants.

- Vitamin - E
- Lycopene
- Ferulic Acid
- Caffeic -
- Asta xanthine.

6) Jojoba oil is also present in Vollsal Emulgel

- Diclofenac - topical
- 20% Jojoba oil

- Diclofenac with Jojoba oil ⟶ Increase effectiveness
- Diclofenac w/o - - ⟶ Decrease -

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Theobroma oil :- It is not oil but fat.

Synonym :- Cocoa butter, Oleum cacao, Cocoa beans

B.O :- Theobroma cacao

Family :- Sterculiaceae

Part used :- Dried roasted seeds

Preparation :- Seeds ⟶ Heat at 30–40°C ⟶ Seeds (نیم گرم) Dug underground (boxes) ⟶ Fermentation

Fermentation ⟵ Before ⟶ ↑ Bitter and Astringent, while (زبان کا سکڑنا، کڑواہٹ)

After ⟶ less Dark

Roast at 100–140°C ⟵ Before

↓

Remove the shells of seed ⟶ Press by Roller ⟶ Paste obtained

↓

Have 50% cocoa butter

Characteristics :-

M.P :- 31 — 35 °C

The difference in its M.P is b/c there are polymeric forms of cocoa butter. So they all have M.P from 31 — 35°C. and these polymorph obtained by different temp. at Roasting.

Low temp. cocoa butter not suitable it is used in suppositries which melt on body temp.

Chemical Constituents :-

- Esters of Stearic Acid (34%)] Saturated
- Esters – Palmitic – (25%)]
- — – Oleic — (30%)] Unsaturated
- Flavenoids
- Phytosterols

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Uses :-

1) Suppositories bases for lipophilic/Fat soluble APIs.
   ↓
   b/c its m.p is near to body temp.
2) Cooking purpose
3) Chocolate manufacturing
4) Emollient

Cotton Seed Oil (important)

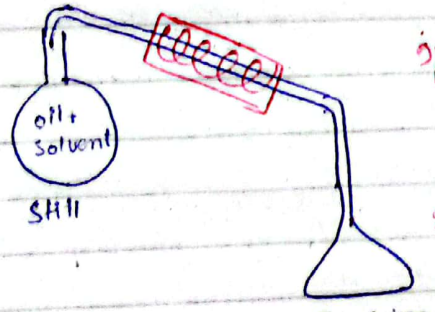
Synonym :- Cotton balls
B.O :- Gossypium herbaceum
Gossypium hirsutum
Family :- Malvaceae
Part used :- Dried seed

How to Obtained? Cold pressing & Solvent Extraction.

REFIINING :- ہم Refining میں Preparation کے Oil میں
Steps پانچ سے بارہ میں سے اس کو یہ Step

1. Distillation
2. Degumming
3. Neutralization
4. Bleaching
5. Winterization
6. Deodorization.

1. Distillation :- Liquid separation on the basis of B.P.



If oil has;
low m.p → Receive from Receiving flask

If Solvent has
low m.p → Receive "

2. Degumming :- To remove Gums, Proteins, Polypeptides, Pectin.
Mix Hot water b/c Gum, Pectin & Polypeptide soluble in it and Proteins Denatured.
Then Decantation and Centrifugation to remove it.

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3. Neutralization:- Oils have the problem of Rancidity, Stability and Drying b/c of unsaturation.

Fixed oils:- Esters of unsaturated FA with Glycerol

The rxn on the above problem occurs with TGs.

- If free FA present in oil then it react fast with oxygen (more reactive) - Auto-oxidation, Rancidity.

- By Neutralization free FA removed. if reacted with base.

FA + NaOH ⟶ Soap formed & filter it.

- If it ↑es in No. then

اس کا اپنا طریقہ ہے

4. Bleaching:- Pigments are removed.

↓

Gossypol — toxic

By addition of Adsorbant, pigments are removed

↓

Charcoal, Sand, Carbon column

5. Winterization:- ونٹرائزیشن, De waxing.

Store it at 4 — 5°C (low temp) if wax is present it will solidify. and remove the solid.

Winterized oil ⟶ No wax

6. Deodorization:- Odor b/c of V.O.

So Heat it. and it will evaporate.

Composition of cotton seed Oil:-

Esters of Polyunsaturated FA (52%)

- - Mono - - (18%)

- - Saturated - (20-25%)

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Polyunsaturated:- Linoleic Acid
Linolenic —

Monounsaturated:- Oleic

Saturated :- Palmitic
Stearic

- It is Drying oil

Uses :-

1) Food purpose
2) Salad
3) Soap formation
4) Pesticides.

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Tannins imp

Definition :-

"Tannins are natural phenolic compounds, having tendency to complex proteins and precipitate them."

(کھال)

- Scientist discovered it working on Animal hides proteins in leather formation.

Animal hides —Tannins→ Leather

Detection of tannins :- By ① Gold beater's skin test & basically use for True tannins.

Qualitative test

Gold beater's skin :- It is a membrane made from Ox intestine

Procedure :-

1. Dip the Gold beakers skin in 2% HCl
2. Rinse with distilled water.
3. Place in test solutions.
4. Wash with distilled water
5. Dip in 01% ferrous sulphate
6. Color obtained. If membrane color is Black or Brown then tannins are present otherwise Absent.

2,3 :- Ferric chloride test - پریکٹیکل میں آئے گا۔

4. Phenazone test :-

1. Take 05 ml of Aqueous extract of drug & add 0.5g of Sodium phosphate.
2. Heat it
3. Cool it
4. Filter it
5. Add 2% phenazone to filterate. if precipitation occur tannins are present

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5. Catechin test :- (Commission imp)

1. Dip match stick in plant Extract
2. Dry it
3. Then dip it conc. HCl.
4. Heat gently, the match stick will burn with Pink or Red flame.

Catechin + HCl ⟶ Phloroglucinol

And when phloroglucinol heated, Red or Pink flame will produced.

Qualitative test imp

Quantitative test :- A membrane having standard absorption power & having known % of protein. If we place it in test soln. for 5 mins and analyse it. Suppose we have 10 units of protein in membrane & in analyzation the machine identify 06 units so it have 04 protein binded with tannins.

Properties of tannins

1. Color :- Pale yellow to orange.
2. Their aqueous soln. are slightly acidic.
3. They have Astringent effect
4. They form colloidal soln. in water.
5. They are non-crystallizable compounds.
6. They are soluble in dilute alkalies, alcohol, glycerol and Acetone.
7. They precipitate proteins, Heavy metals, Gelatin, Alkaloids and Glycosides. due to this reason they are Antidote for Alkaloidal & Heavy metal poisoning.
8. Due to their Astringent effect they are chemostatic (Stop Bleeding), Protect plant. Pharmacognostic term = styptic. means Hemostatic. When infection caused to plant, its tannin content Yes.
9. Tannins also help to Herbivores to not eat it due to its Astringent effect.

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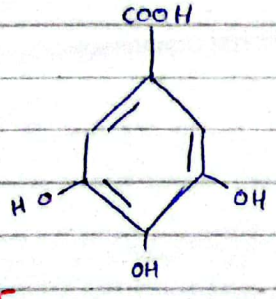
Classification of Tannins

- Hydrolyzable tannins
  - Gallotannins
  - Ellagitannins
- Complex tannins
- Condensed tannins (Non-Hydrolyzable)
- Pseudo tannins

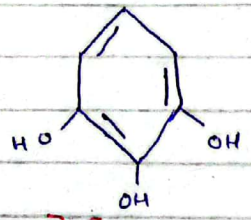
Hydrolyzable tannins :- These are hydrolyzed by Acids or Enzyme (tannase). Also called Pyrogallol tannins

- They are made up of various units of Gallic Acid, Ellagic Acid bonded to polyhydroxy moities (sugars).

Gallotannins / Gallitannins :- Gallotannins are hydrolyzable tannins in which multiple gallic acid units are bonded to sugar moities and each other.



[3,5,5 Trihydroxy Benzoic Acid OR Gallic Acid]

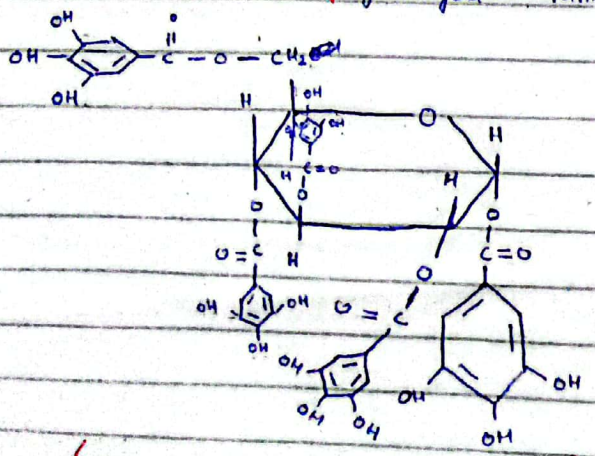


[2,3 dihydroxy phenol OR Pyrogallol.]

Why Hydrolyzable tannins called Pyrogallol tannin?

Pyrogallol is a compound same as above have no COOH. On Dry distillation, they yield pyrogallol.

(Hydrolyzable tannins)



(1,2,3,4,6 penta Galloyl Glucose)

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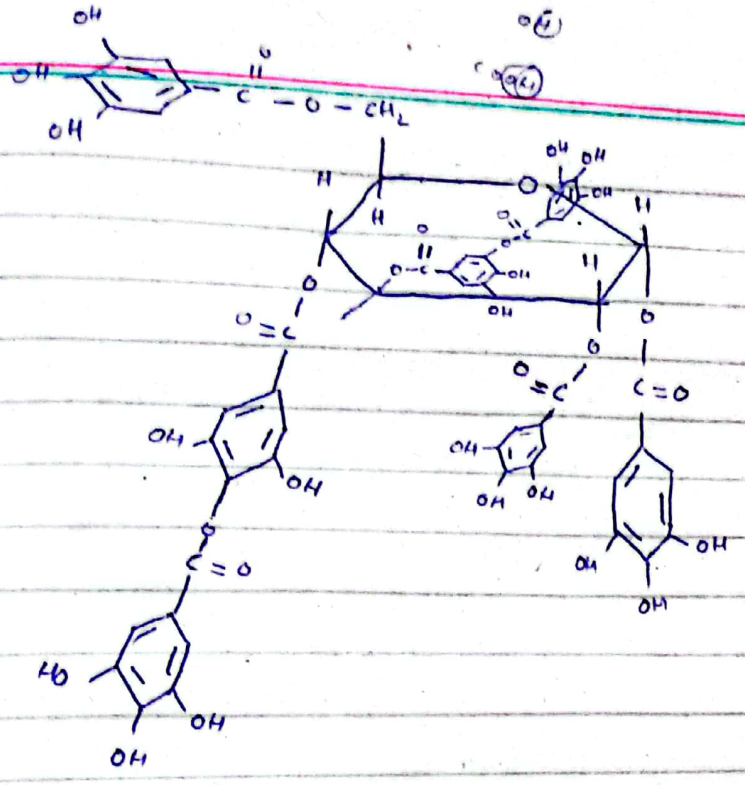

3,4 di [di-galloyl](1,2,6) trigalloyl glucopyranose.

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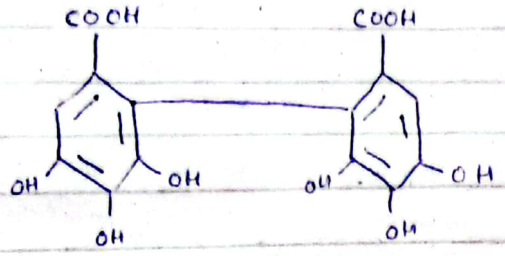
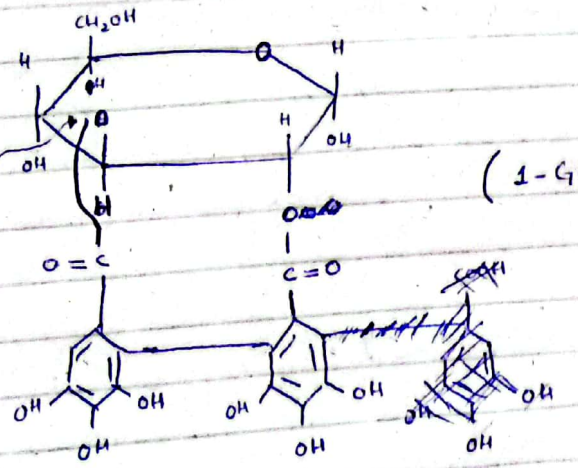
Ellagitannins:- These hydrolyzable tannins consist of; Hexahydroxydiphenic Acid (HHDP) residues bonded to sugar molecules, their derivatives.

- Largest group of tannins > 500 compound are classified.
- HHDP is formed via oxidative coupling of two Gallic Acid molecules



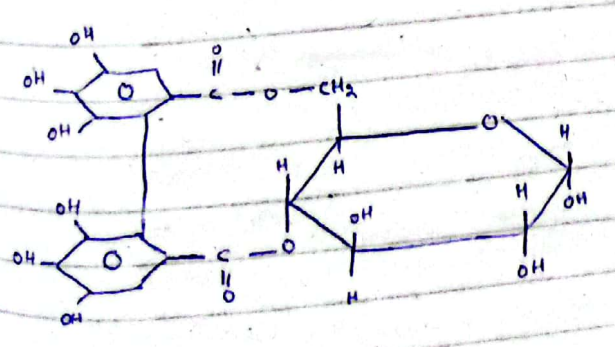
(HHDP) — Gallagyl

- 01 HHDP form two ester bond with sugar b/c Ester bonds form b/w Alcohol & Acid so Glucose have only Alcohol Group & it will bond with COOH of & HHDP.



(1-Glucose, 2,3 HHDP)

اگر یہ O والا chain بنائے گی تو کوئی مسئلہ نہیں۔



(1-Glucose, 4,6 HHDP)

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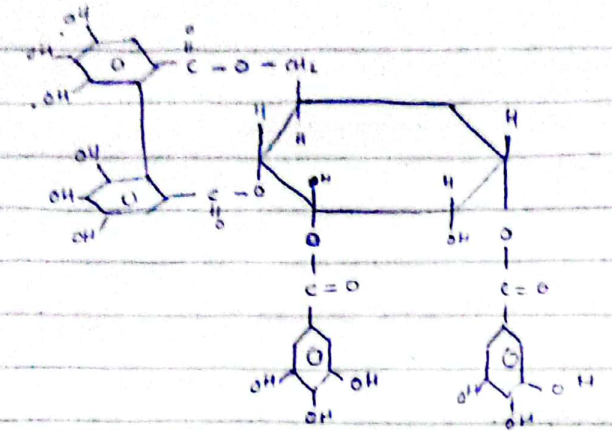


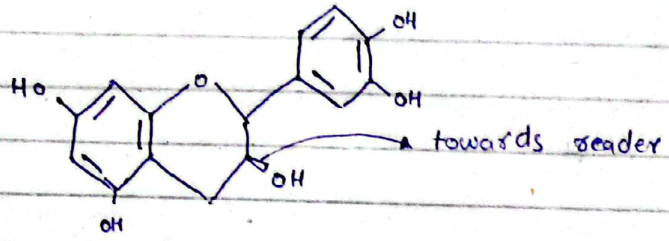
(Heterophyllin-A) Natural Ellagitannins

→ Also known as Catechol tannins

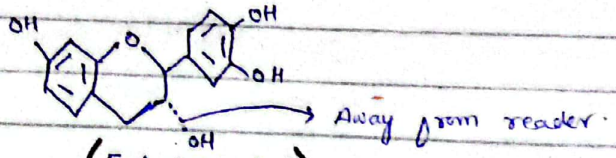
Condensed tannins :- Non-Hydrolyzable by acid Enzyme

Also known :- Proanthocyanidins, Catechol tannins.

- They do not contain sugar molecules
- They oligomeric (2-8) & / or Polymeric (>10 — 50) and its monomer known as Catechins. (Leucoanthocyanidins).
- They resemble flavenoids and chemically they are Flavan 3-ols



(Catechins.)



(Epi-Catechin)

On dry distillation they yield catechol

(Adjacent -OH groups)

(Catechol)

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Complex tannins: These are formed by condensation of hydrolyzable (Gallotannins & Ellagitannins) tannins and catechins.

Pseudotannins

Polyphenolic compounds of low molecular weight.

True tannins	Pseudotannins
• Mol. wt :- 1000 — 5000	• ~500
• Gold beater skin test +tive	• -ative.
• True tannins precipitate protein. Precipitation power is more	• Conc solution of pseudotannins can precipitate protein (Gelatin). Precipitation power is low. OR ↳ Pseudotannins can ppt dilute soln. of Gelatin.

Examples:- Gallic Acid, Chlorogenic acid

Pseudotannins form the building block of true tannins.

And Catechin.

- Present in tea, coffee, etc.
- Present in Catechu, Kino
- Present in Rhubarb

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Hamamelis :-

Synonym :- Witch hazel

B. Name :- Hamamelis virginiana

Family :- Hamamelidaceae

Part used :- Dried leaves

Indegmous to :- US and Canada

Chemical Constituents :- The ~~plant~~ leaves contain tannins not less than 30 % of total polyphenolic contents.

* It contains ; • Gallitannins • Ellagitamins
• Free Gallic Acid • Condensed tannins • Traces of V.O
• Bitter principles.
* The bark also contains ; Hamamelitannins

Uses :-

1. Astringent
2. Anti-septic Same as Dettol
3. Anti-inflammatory :- Inhibits 5-LOX [Lipoxygenase]

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Myrobalan :- ہلیلہ Exam کے لئے

Synonym :- ہلیلہ

B. Name :- Terminalia chebula

Family :- Cambretaceae

P. used :- Fruit

C. Constituents :- 20 — 40% tannins
Fixed oil

Use :- Astringent

Catechu :- کتھا Exam

Synonym :- Pale catechu, Gambir

B. Name :- Uncaria gambir

Family :- Rubiaceae

Part used :- Dried leaves & twigs (پتے)

Black Catechu :-

B. Name :- Acacia catechu

Family :- Leguminosae

Part used :- Heartwood - Bark (دل کی لکڑی)

Chemical Constituents :-

- Catechu 7%
- Catechutannic Acid 22 — 50%
- Catechu Red
- Quercitin
- Gambir - fluorescin

Moisture content :- Not more than 15%.

Water insoluble matter :- " " " 33%.

Use :- Astringent
Anti-septic
Wound healing

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Kaqmeria :- نہیں آتا میں Exam

Synonym :- Rhatany
B. Name :- Krameria triandra
Family :- Krameriaceae
Part used :- Dried roots

C. Constituents :- * Condensed tannins / Proanthocyanidin
- Rataniaphenol I
- Rataniaphenol II

* Phlobaphenes
- Product of condensed tannins
- Red in color

Use :- Same as of Tannins

Kino :- نہیں آتا میں Exam

Synonym :- Mandarin (چینی پرانی زبان)
B. Name :- Citrus spp.

Citrus deliciosa — Citrus mobilis

1935 میں America میں سب سے پہلے Hybrid بنایا گیا

Family :- Rutaceae
Part used :- Dried fruits and juice also

Nutgalls :-

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Resin

Definition:- Resins are solid or semi-solid exudates (mostly from plants) formed in Schizogenous or Shizolysigenous ducts / cavities.

Animal Resin

Shellac from insect.

Usually Occur:- in combination with other secondary metabolites

1) Oleoresin
2) Oleogum Resins
3) Gum Resins
4) Glycoresin
5) Balsam

Oleoresin

* Resin present in combination with volatile oil
  e.g Ginger, Capsicum

Examples:-

1) Oleoresin	Ginger, Capsicum	(V. oil + Resin)
2) Oleogum Resins	Asafoetida, Myrrh	
3) Gum Resin	Gambage	
4) Glycoresin	Podophyllum, Jalap	(Glycoside + Resin)
5) Balsam	Tolu Balsam, Storax	Resin in which Balsamic acid present
	Peru — , Benzoin	

Balsamic Acid = • Benzoic Acid
• Cinnamic Acid

Chemistry of Resins:- Resin contains;

1) Resin Acid
2) Resin Alcohol
3) Resenes

Resin Acid:- The include oxyacids, carboxyllic & Phenolic Acids.
They may be present in free or esterified form
They give reactions with Alkaline compounds.
e.g Abeitic Acid
Pimaric —

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2) Resin Alcohol's :- 2 - types

Resinols	Resinotannols
Resin in which tannins are absent	Resin in which tannins are present
e.g Storesinol	e.g Sumaresinotannols.

imp

3) Resenes :- • These are neutral compounds
• — — non-reactive (inert).
• — — Hydrophobic.
e.g. Copalresene

Benzoin

Indonesia-city

Synonym :- Siam Benzoin, Sumatra Benzoin, Gum Benjamin.
B.Name :- Styrax benzoin (Sumatra) اردو = لوبان
Styrax tonkinesis (Siam)
Family :- Styraceae
Part used :- Exudate obtained via incisions into the stem of the plant.

Standard :- It contains not less than 25% balsamic acid. calculated as cinnamic acid

C. constituents :- • Cinnamic Acid (25 %)
(Free / Esterified form)
In sumatra benzoin cinnamic acid is double of Benzoic Acid.
In siam benzoin Benzoic acid is more than cinnamic Acid.

Esterified Form :-
• Coniferyl Benzoate
• — cinnamate
• Sumaresinotannol
• Sia — —
Sia resinolic Acid

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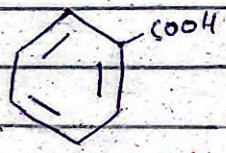
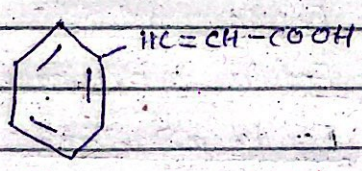
- Benzyl Benzoate
- Benzyl cinnamate
- Cinnamyl cinnamate



Benzoic Acid



Cinnamic Acid

Use:-

1) Expectorant (Productive cough)
2) Anti-septic
3) Stimulant
4) Ingredient of Compound Benzoin tincture
5) Its inhalations are used to relieve respiratory discomfort.

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Asafoetida :-

Synonym :- Devil's dung, Heeng

B. Name :- Ferula foetida
Ferula rubricaulis
Ferula asafoetida

Family :- Umbilliferae

Part used :- Exudate obtained by making incisions in the roots and rhizome of plant.

Indeginous to :- China, Afghanistan, Pakistan, India.

C. Constituents :-

* Oleogumresins
  - V. oil (4-20 %)
  - Gums (10-15 %)
  - Resins (40 %)

Its odour is due to sulphur compounds present inthe V. oils of Asafoetida.

e.g Isobutyl propanyl disulphide

In its Resins ;

- Asaresinotannol
- Ferulic Acid (Free & Esterified)
- Umbellic Acid
- Umbelliferone (very small Quantity)

Uses :-

1) Carminative
2) Expectorant
3) Anti-Spasmodic
4) Laxative
5) Condiment.

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Podophyllum :-

Synonym :- Mandrake, American mandrake, Mayapple.

B. Name :- Podophyllum peltatum (American)
Podophyllum hexandrum Or (Indian)
Podophyllum emodi (Indian)

Family :- Berberidaceae (Old)
Podophyllaceae (New)

Part used :- Glycoresin obtained from roots and rhizome of the plant.

Indegimous to :- American, Canada, India, Pak.
High ellevation plant (ઊંચાઈવાળો)

C. Constituents :-

American	Indian
1. Resin (3-6 %)	1. Resin (6-12%)
2. Active constituent of Resin = Podophyllotoxin – 20%	2. –40 %
3. α - Peltatin (10 %) β - Peltatin (5%) — Resin	3. No Peltatin are present.
Classified as Lignans	

Podophyllotoxins present in free form Or conjugated with sugar

Use :- Due to podophyllotoxins

1) Purgative b/c it is Gastric irritant and in higher dose it is very toxic

2) Anti-cancer

Etoposide
Teniposide — Product of podophyllotoxin in the market and used for cancer.

- Lung's cancer
- Ovarian cancer
- Kaposi's sarcoma
- Testicular –
- Ewing's syndrome

They are inhibitor of topoisomerase II (DNA Gyrase)
↓
Break the double stranded DNA. So the

|| → \ / → || //

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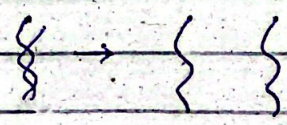
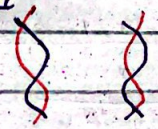
1) When the double stranded DNA separates



2) Other chain comes and bind to both strand - Also done by topoisomerase-II



3) When the topoisomerase inhibition binding / Ligation not occur and drug comes and bind to these strands - DNA changes. When DNA changes, Apoptosis occur. (Body killed its own cell)

* Podophyllum in older times used to treat the skin warts (مسے) → Escharotic

NOTE:- It is very toxic plants, toxicity on GIT, Vomiting, Diarrhea occur, B.P ↓, Seizures and death,

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(viva)

Rosin :-

Synonym :- Colophony resin

B. Name :- Pinus palustris
Pinus longifolia (Pak) Or Pinus roxburghii
Pinus halepensis

Family :- Pinaceae

Part used :- Oleoresin obtained from the bark of tree by making incision.

Collection & Preparation :- Long & weak incisions are made longitudnally into bark using knife or other sharp objects. A cup (metal/ copper) is placed beneath the incision for the collection of oleoresin.
The crude oleoresin is separated from the terpentine oil by steam distillation.

From Pine we obtaine;
- Turpentine oil (↓ B.P)
- Rosin
- Pine nut (چلغوزہ)

C. Constituents :-
- Resin Acid (90%)
- Resenes (10%)
  - Abielic Acid
  - Pimaric Acid

Uses :-
1) Stiffening Agent in Ointments & Plasters
2) In the manufacture of paints, varnishes & Polishes.
3) Sometimes used as Diuretics in veternary settings.

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(Not imp)

Jalap :-

B. Name :- Ipoomea purga
Family :- Convolvulaceae
Part used :- Olegum resin obtained from tuberous root or rhizome of plant.

C. Constituents :-
* Resin (8-12%)
* Starch
* Gum
* V. Oil

Main constituent of Resin = Convolvuline (Free/Esterified)

Use :- Purgative

(Not imp)

Ipomea :-

Synonym :- Orizaba jalap
B. Name :- Ipomea orizabensis
Family :- Convolvulaceae
P. used :- Same as above.

C. Constituents :-
* Resin (10-20%)
* Sugar
* Calcium Oxalate
* V. (volatile) Compounds
* Alkaloid (Scopoletin)

Main constituent of Resin = Jalapin
Jalapinolic Acid.

Use :- Purgative

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Myrrh :-

Synonym :- Arabian / African Myrrh
B. Name :- Commiphora molmol
Commiphora abyssinica
Family :- Burseraceae
Part used :- Oleogum resin obtained by making incision in the stem of the plant.

C. Constituents :-
- Resin (25 – 40 %)
- Gum (57 – 60 %)
- V. Oils (10 – 17 %)

* Main constituent of Resins are ;
↳ α, β and γ Commiphoric acid
It also contain Resenes
* Volatile Oils contains ;
- Eugenol
- Lemonene
- Cuminic aldehyde

* Gum contains ;
- Proteins
- Galactose
- Arabinose
- Glucuronic acid

Uses :-
1. Carminative
2. Incense and perfumes
(اگر بتی وغیرہ) → خوشبودار دھوئیں کے لیے استعمال ہوتا ہے۔
3. Local Anti-septic
4. Topical Astringent
5. Mouth washes – For oral cavity infections.

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Cannabis :-

Synonym :- Chars, چرس, Hasheesh, گانجہ, Marijuana
Indian hymph

B. Name :- Cannabis sativa

Family :- Moraceae OR
Cannabinaceae

Part Used :- The resin obtained by rubbing or pressing
- flowering tops
- Leaves
- and sometimes stem also.

Ganja :- It is made from the large leaves, longer stems and fruits of the plant.

Bhang :- It is made from the leaves, stems and flowering tops of both male / female plants.
- The parts are dried and grounded (گرائنڈ) followed by serving as liquid solution.

Chars :- The Resin obtained from flowering tops of the live plants by rubbing or pressing.

Hashish :- The Resin obtained from dried flowering tops.

Before Drying — Chars
After Drying — Hashish.

Indeginous :- Pak, India, Neepal, Afghanistan.

C. Constituents :- Resins (15-20%)
↳ Compound of Resin — Cannabinoids
↳ More than 60 cannabinoids found in Resins

Cannabinoids :-
1. Cannabinol
2. Cannabidiol (CBD) — useful
3. Camabigerol
4. Tetrahydrocannabinol (Δ^9-THC) ← مارے نشہ اس گروپ سے ہیں

Legal Policy :-

Govt. offer to cultivate Cannabis with low level of Δ^9.THC and with High level of Δ^9. THC is prohibited.

Uses :-

1. Anti-spasmodic
2. Anti-emetic
3. Anti-convulsant
4. Appetite Stimulant (بھوک لگاتا ہے)

Disadvantages :-

1. Narcotic :- It is a controlled substance ہے liscence اس کا اپنا بیچ سکتا۔ اس کو اپنا
   کوئی نہیں بیچ سکتا
   اس کی کاشت سب نہیں کر سکتے
   Control of Narcotics - 1997
2. Intoxicant نشہ آور
3. Causes physical & Psychological dependence.

Products :-

- Nabilone
- Dronabinol → Anti-Emetic (in chemotheraphy)

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Tumor Inhibitors
(Anti-cancer)

- Catharanthus
- Colchicum
- Podophyllum
- Taxus

(Anti-biotics)

- Rifamycin
- Macrolide

Taxus :-

Synonym :- Yew
B. Name :- Taxus baccata
Taxus brevifolia
Taxus wallichiana
Family :- Taxaceae
Part used :- Dried roots, leaves and barks.
Indegimous to: Pak, India (Hilly areas)
← ایک جھاڑی نما درخت ہوتا ہے اور تنا بھی موٹا ہوتا ہے۔

C. Constituents :- * Tricyclic diterpenes with taxanes nucleus.

important constituent → • Taxol (0.01%) • Taxine • Baccatine
1 ton of plant = 1kg taxol • Taxusine.
* Sterols
* Polysaccherides
* Flavenoids
* Cyanogenetic Glycoside.

Products :- Paclitaxel, Docitaxel] Semi-synthetic

Uses :- Anti-cancer ⇝ Ovarian cancer, Lung cancer, Head and neck cancer Colon carcinoma, Gastric -

Mechanism of Action :- It inhibits the polymerization of tubuline
The drug is administered I/v with 03 weeks interval.

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Rifamycin Antibiotics :-

- They were isolated from Streptomyces mediterranei in 1950.

Natural Axe :- Rifamycin A, B, C, D, E

- When Rifamycin B is purified it become unstable, so they change it into Rifamycin S and then modify it into Rifamycin SV.
  First used - only I/V

Then Rifampin is maded which used orally.
(First oral Anti-tubercular) - First line drug

Rifabutine, Rifaximin and Rifapentene are also available.
used in Hepatic encepelopathy. % of its poor absorbant from GIT

Mechanism of Action :- The anti-bacterial activity of the group depends on inhibition of bacterial DNA - dependent, RNA synthesis
Rifamycin have high affinity for prokaryotic RNA polymerase. to inhibit it.

and not comes to the blood.

- Lactulose is also used in Hepatic encepelopathy- same reason

Rifampin / Ripamplcin Adverse Effects :-

1. Hepatotoxicity
2. Body fluid discolouration - Red / Pink
   (Urine)

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Macrolide :-

- These are macrocyclic (Greater than 08 membered ring) lactones bonded with De-oxy sugars so they are lactone Glycoside.

  Glycoside :- Sugar + Non-sugar (Lactones)

Medicines Are :-

- Erythromycin → 1st discovered
  Azithromycin
  Clarithromycin

- They are used as alternate to penicillins in patients hypersensetive to penicillins.

- They also remain integral part of Regimen for COPD due to their Anti-inflammatory and immunomodulating properties

Adverse Effects :-

1. Esteolate (Erythromycin esteric form) :- Hepatotoxic
2. They have the tendency to prolong QT interval.

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Natural toxicants

(imp)

- **Higher Plant toxins**
  - Myristicin
  - Thujone
  - Cyanogenic glycoside
  - Opium
  - Cannabis
  - Jequirity
- **Lower Plant toxins**
  - Bacterial toxins
  - Algal toxins
- **Mycotoxin**
  - Fungal toxins
  - Mushrooms.

* **Plant toxins :-** These are naturally occuring consistuents of both High molecular wt. (HMW) and low molecular wt. (LMW); accumulated in one or various parts responsible to cause severe symptoms of physical, mental, ↓ Or behavioural disturbances upon ingestion. Physiological

Role of toxin in Plants :- For their own defence mechanism and for protection against predators and against insects, birds etc.

Chemical Nature :- They may consists of alkaloid (Opium), Aromatic alcohols / Phenols (Cannabis), Glycoproteins (Jequirity), Volatile components (Thujone)

Route of toxicity :- Oral ingestion. i.e mushrooms faulty identifications.
Also by ingestion in higher quantities.
Consumption of Rotten edible materials/food.
All these leads to systemic toxicity
Touch and irritation → Localized toxicity

General Management of Poisoning :-
It is succesful if:
1) toxins taken orally
2) After taking toxin orally, person should reach hospital in 02 hours

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In Hospital they Do:

1) Gastric lavage :- Stomach washing by Activated charcoal / Carbon

2) Gag reflex (منہ میں انگلی ڈال کر قے کرنا)
- لیکن بیہوشی میں یہ نہیں کرتے کیونکہ اس سے سانس کی نالی بند ہوتی ہے۔

3) Conc. soln. of Sodium chloride — Brine

4) Apomorphine → central emetic

5) Specac syrup

6) Injection Apomorphine.

7) If toxicity is b/c of Acids / base then emesis is not done b/c it disturbs the trachea ~~and~~ ~~give~~

8) If toxin nature is unknown then give drastic purgative and give I/V Electrolyte infusion to balance the electrolyte. and check the BP.
→ Ringer Lactate

Homemade things that Adsorb toxins :- But in 40 mins

1) Strong tea / coffee — Alkaloidal poisoning
use in e.g Datura → Atropine, Hyoscine, Hyoscyamine

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* Myristicin :- It is a phenolic compound (isoprene derivative) present in volatile oil of nutmeg

Synonym :- Jaipal جائفل

B. Name :- Myristica fragrans

Family :- Myristicaceae

Part used :- Seed and aril

Toxicity :- When nutmeg is consumed more than 25-30g toxicity occurs.

How Myristicin cause toxicity?

- Metabolize in liver Methylene, ~~Methylen~~ Methoxy ~~does~~ der. amphetamine
- It has psychoactive properties.
- As amphetamine is stimulant, so it cause insomnia which leads to anxiety, also causes lack of cognition.
- Symptoms of toxicity appears after 30 hours.

Severe Symptoms :-

- Hypertension
- Hallucination
- Convulsion and death

Mechanism :- 1. Myristicin —(metabolize in liver)→ Methylene methoxy der. Amphetamine.

- Psychoactive / Psychedelic (-ghuekm)
- Stimulant

2. It is a weak inhibitor of MAO. (Partial Agonist)

* In low dose
  - Empathy feeling
* When too alert
  - lack of conc./cognition

NOTE :- Inhibits metabolism of mono amines (Nor-Adr, DOPA, $5HI_3$) resulting in slight rise in mono-amine.

Due to ↑ Nor-Adre :- Tachycardia, Palpitations

- - ↑ Serotonin :- $5HT_{2A}$ involved in empathy, cognition

- - ↑ Dopamine :- Pleasure / Reward (major); work of Dopamine.

Symptoms of toxicity appears :- after 3-6 hours of ingestion.

Scanned with CamScanner

Source :- Artemisia spp.
Thuja accedentalis
Mint

Thujone :- Ketone (isoprene derivative) present in the volatile oil of Artemisia spp.

Thuja Occedentalis and mint uses :-

- Perfume, Carminative and Alcohol beverage

(* For Artemesia spp. ; Absinthe (spirit) of 10-15 mg/100ml 300 mg/100ml) Thujone is separated which is used in food and Alcoholic beverages for flavour

Toxicity :-

- In mice 60 mg/kg kills mice
  ↳ 30mg/kg has no effect

Mechanism :- Thujone is GABA (R) Antagonist and it causes convulsions.

- Overdose causes insomnia, muscle spasm, spastic paralysis convulsions and death

Note :- Before we were unaware
Absinthe - contain 300mg/100ml
But now
10-15mg/100ml.

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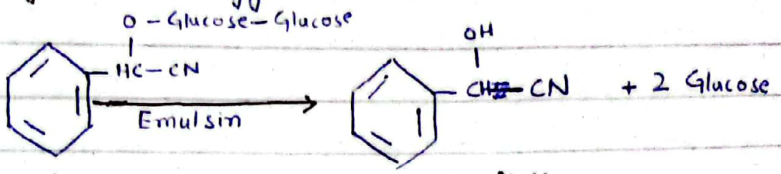
Cyanogenic Glycosides

1. Wild Cherry 2. Apricot 3. Plum
4. Bitter almonds 5. Apple seeds

Bitter Almonds :-

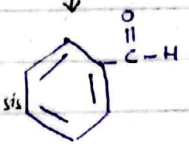
B. Name :- Prunus amygdala var. amara
Family :- Rosaceae
Cyanogenic Glycoside :- Amygdalin.



Amygdalin → Mandelonitrile

Prunacin = 01 Glucose.
Amygdalin = 02 Glucose

This process is called Cyanogensis



+ HCN → very toxic

* Cyanide toxicity :-

- Cyanide is inhibitor of Cytochrome C. oxidase (part of ETC) non-competitive
- So transfer of es to oxygen is stop. Oxygen es ETC سے آگے نہیں جا سکتے
- And oxidative phosphorylation (part of Aerobic respiration) stops
- Suffocation (shortness of breath) = (Asphyxiation) گلا گھونٹنا، گھٹن

Symptoms of toxicity :-

1. Asphyxiation
2. Shortness of breath - Dysnea.
3. Palpitation, tachycardia
4. Altered consciousness

* Cyanide toxicity is type of Histotoxic hypoxia.

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Met Hb اگر زیادہ ہو جائے تو جان جا سکتی ہے۔

Managment of toxicity :-

1. Nitrites :- Amyl nitrite (Dose dependent)

↳ It changes Hb ⟶ Met Hb

- Have iron Fe^{+2} (Ferrous)
- Have iron Fe^{+3} (Ferric)

Nitrite Convert کرتی ہے Fe^{+3} کو Fe^{+2} میں۔

Met Hb does not carry O_2 but carry cyanide & take all the cyanides outside.

2. 4-DMAP :- Dimethyl amino phenol (parenteral)

یہ بیہوشی کم کرتا ہے لیکن یہ بہت تیز کام کرتا ہے۔

Dose :- 2-3mg/kg.

3. Sodium thiosulfate :- Mitochondria have enzyme Rhodonase which changes Cyanides into thiocyanates in the

$CN^- \longrightarrow SCN^-$ (not very toxic)

presence of sulfur donor. So Sodium thiosulfate donates the sulfure

4. Hydroxocobalamin :- Synthetic derivative of vitamin B-12

- It is used for Anemia.
- It have high affinity for cyanides

Hydroxocobalamin + CN ⟶ Cyanocobalamin.
(Vitamin-B12)

5. Cobalt-edetate :- Complexing Agent

General management :-

1. Monitoring of vital signs
   - ↳ Heart Rate → Dopamine (low the B.P)
   - ↳ Blood pressure → Furosemide (low the B.P)

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Cannabis toxicity

B. Name:- Cannabis sativa

Family: Moraceae OR
Cannabinaceae

It is Resin

Routes By which Cannabis can be taken:-

1. Inhalation → Smoke → [•Quick onset of Symptoms •Required small amount to cause psychoactive active]
2. Oral → Ingestion

Psychoactive Effect Dose:-

- 2-3mg THC — Inhalation
- 10-15mg THC — Oral

* One cigarrele contain 30mg THC.

Symptoms of toxicity appears:-

5-10 mins — Inhalation

40-60 mins — Oral

* 90% cannabis toxicity founds in Adolescents.

Mechanism:-

① In our body endocannabinoid system present having 02 Receptors Cannabinods binding ® 1 and 2

(CB1)

* More concentrated in CNS
- Frontal cortex, • Hypothalamus
- Hippocampus • Cerebellum
- Vomiting center M.O

(CB2)

* PNS
- Immune cells
- Glial cells

. ↳ ... toxicity Σ Cannabis

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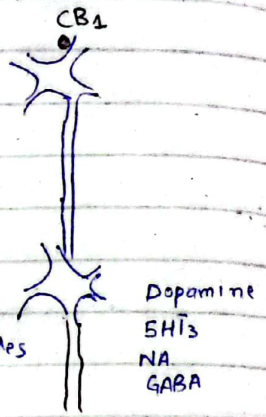
* CB_1 and CB_2 are GPCR G-Protein coupled ®. and are of Gi type

AC ↓ cAMP ⟶ ↓ Ca^{+2}, ↓ K^+ By opening K^+ channel.

- Not release from ERR [endoplasmic reticulum]
- Not comes from ouside

② Neurons are connected to each other ۔indirectly cannabinoids can effect neurons and ↓es the release of Neurotransmitters.



↓es Noradrenaline → ↓ Heart rate
↓es Acetylcholine → ↑ Heart rate
In acute cannabis toxicity Heart rate ↑es
(شروع میں ہوتا ہے)

Clinical manifestations:-
1. In acute toxicity → tachycardia
2. GABA ↓es → Muscle relaxation → Fatigue.
3. GABA ↓es → Restlessness
   Insomnia
4. Euphoria (Psychoactive Effect)
5. Hallucination
6. Dillusions (Wrong interpretation)

Severe Symptoms:-
1. In acute toxicity seizures
2. Stupor
3. Coma
4. Death

زہنہ اور بیہوشی کی حالت میں کوئی اگر آپ تو مارے تو آپ کی Body کچھ Respone نہیں دیتی۔

Management:- No Specific medication.
- Symptomatic and supportive treatment
- Counselling
- In seizures Diazepam are Rxed.

اس میں Heart rate اور seizure کم ہو جاتا ہے۔

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Opiate toxicity :-

B. Name :- Papaver somniferum
Family :- Papaveraceae
Part used :- Poppy capsules exudate

C. Constituents :- Alkaloids
↓
Morphine, Codeine, Narcoline, Thebaine, Nascopine
↓ derivative
Heroine.

Routes of toxicity :-

- Oral
- Inhalation
- Parenteral (fast onset)

Mechanism of toxicity :-

1. They act on opioid Receptor. They are G-protein coupled (R)
   - mue μ (Major Receptor)
   - Kappa k
   - Delta δ
2. They block the pain in the Ascending pathway Dorsal route Ganglion. and in the descending - they activate Descending inhibitory pathways.
   - Blocks Ascending Pathway
   - Activate Descending -

Clinical Manifestation :-

1. Miosis (constricted pupil)
2. Constipation
3. Drowsiness
4. Fatigue
5. Urinary Retention sometimes
6. low B.P B/c
7. low Heart rate

morphine activate Histamine induced activity

Due to activation of μ (R) in myenteric plexes so peristalsis ↓es

Why Opioid Cause Death ?:- Due to severe respiratory depression.
All muscles relax no contraction occur
Diaphragm
Intercostal muscle

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Managment of toxicity :-

1. Antidote :- Naloxone — Competitive antagonist
   ↳ More commonly used
   Naltrexone.
2. Supportive theraphy [O_2 intake by cylinder]
3. For constipation give Suppositries, Enema

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Tequirity toxicity:- ∵,

B. Name :- Abrus precatorius
Family :- Leguminosae
Part used :- Seed

Toxin in Seed :- Abrin (Glycoprotein)

Route of toxicity :-
1. Ingestion (Oral)
2. Inhalation (if powder)
3. Injectable (Abrin is water soluble)

Mechanism of toxicity :- It is inhibitor of cellular protein synthesis.
Lethal Dose = 0.7 µg/kg of body weight
So it is classified as biohazardous material but it is not used in bioterrorism or any war fare.

Symptoms of toxicity :-
Symptoms Due to Inhalation :-
1. Respiratory distress
2. Fever
3. Cough
4. Pulmonary edema
5. Hypotension followed by Respiratory collapse - Death

Symptoms Due to Ingestion :-
1. Vomiting & Diarrhea
2. Dehydration
3. Hypotension
4. Hallucinations due to imbalance in ions
5. Seizures
6. Multi organ failure (Liver, Spleen, kidney) followed by death.

Death Occurs :- After
Due to Ingestion :- 36 - 72 hours

Managment of Poisoning :-
1. Symptomatic & Supportive care.
2. ↳ IV drips for Vomiting, Diarrhea.
↳ Ringer Lactate, Normal Saline etc.

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3. Gastric lavage via Activated charcoal.
4. Bronchodilatoss
5. Sometimes surgical interventions in case of pulmonary edema.

History:-

Jequirity uses by Goldsmith as weight measuring comparing.

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Bacterial toxins :-

1) Tetrodotoxin
2) Botolinum toxin.
3) Staph. aureus toxin
4) Tetanus toxin.

1) Tetrodotoxin :-

Production :- Produced by symbiotic backeria residing in fish (puffer fish). It is potent neurotoxin.

Mechanism :- It blocks voltage gated Na^+ channel and hence prevents the stimulation of muscles through motor neurons.

So eating contaminated fish or injection of ketrodotoxin can result in paralysis.

2) Botulinum toxin :-

Production :- Produced by clostridium botulinum. It is the most potent bacterial neurotoxin

Types :- Seven types.
A, B, C_1, C_2, D, E, F, G

Lethal Dose :- Estimated Human lethal dose of toxin A is 1.3 – 2ng/kg of body wt.

MOA :- It inhibits the release of acetylcholine from pre-synaptic neuronal membrane. This leads to paralysis. death occurs due to depression of respiratory muscles.

Toxicity Occurs :- By food contamination.

Botulinum useful For :-
1) Wrinkles – By Botox injection which relaxe the muscles.
2) Hypeshydrosis – muscle relax and no sweat comes out (Excessive sweating)

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Staphylococcus aureus toxin:-

Production:- It produces many axotoxins. With respect to their site of Action they can be classified as;

1) Enterotoxins 2) Pore forming toxins etc.

Most Famous Toxin:- α-toxin

- It is pore forming toxins and binds to cell membrane of RBCs and WBC's.
- It is able to form pore in their cell membranes which leads to disruption of focal adhesions and cleavage of cadherin molecules leading to loss of barrier function. This result is lysis of RBCs & WBCs. Functionally it is type of Hemolysin.

4) Tetanus toxin:-

Production:- It is produced by clostridium tetani

Toxins Are:- 1. Tetanospasmin (major) 2. Tetanolysin - Both are neurotoxins

Lethal Dose:- The median lethal dose is 3ng/kg

MOA:- It enters the body via wounded or injected opened skin surfaces. It makes its way to the peripheral nervous system via blood. From PNS, it reaches the inter neurons which secretes Glycine GABA (inhibitory N.Ts) and disrupt their function. The result is Spastic paralysis.

Classical Symptoms:- • Trismus ↓ movement of lower jaw paralyzed بات نہیں کر سکتے

• Opisthotonus ↓ Arch back: Glycine is more in S. cord so it works

Sites where They Present:-

• Road • Ground • Farm houses

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Algal toxins:-

Farmhouse Grounds
1) Microcystins
2) Nodulin
3) Saxitoxin
4) Anatoxin
→ Produce by Blue Green Algae (Cyanobacteria)
Thats why also called Cyanotoxins.

1. Microcystins:-

- Chemically they are; Smaller peptides.
- Poisoning Occurs When; Algae are in larger population. known as Algal blooms.
- Presence:- Algal blooms present in fresh water but by 6;.

Toxicity Occurs By;
1) Contaminated water
2) Contaminated Food
3) " - Fish

Mechanisim:- These are inhibitors of Protein phosphatases
↓
I and II-A

Phosphatase:- Remove phospate.
If phosphate remove from protein, proteins become inactive.
- So when protein phosphatase inhibited Microcystin become activated

Protein Phosphatase involved in;
1) Embryonic Development
2) Cell proliferation.
3) Apoptosis
4) Cancer

Targeted Organs:- Intestine Liver kidney

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They don't absorb in blood so much thats why deshoy intestine.

In intestine they:

1) Cause Gastroentiritis
2) Kill the villi

In Liver they; (major)

1) Cause Hepatotoxicity :- When prokein activates, Cellular process accelarates and Free radical production ↑es. So Oxidative stress ↑es.

↓ causes

- Hepatocytes ruptures
- Fine capillaries in spleen also ruptures, Internal bleeding occer and blood pooled inside → Liver size ↑es

Centrilobular Fibrosis

Nodularin

Chemically:- Peptides
Produced by:- Nodularia

MOA :-

- Microcystcine: Covelantly bonded to Phosphatase
- Nodularin: Non-covelantly bonded to phosphatases

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3. Saxitoxin :-

Also called:- Shell fish poison
Biologically :- It is neuro-toxin

Caused By :- Marine foods
MoA :- Same as of tetrodotoxin.

Signs :- * Motor activity depression

- Disorientation
- Uncoordinated movements
- Lethargy
- Paralysis
- Death due to severe respiratory depression.

Classified As :- chemical weapon in Gaseous form.

4. Anatoxin :-

Common Name :-
It is also known as "very fast death factor"
- Classified as cyanotoxin

Toxicity Occurs in :- North America, Europe & Canada in cattles
Biologically :- Neurotoxin
Present in :- Fresh water - Algal blooms.
MOA :- It binds to the cholinergic Receptor.

Symptoms of toxicity :-
- Salivation
- Diarrhea
- Miosis
- Bradycardia
- Excessive mucos secretion - Respiratory Distress

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Severe Symptoms:-

- Excessive muscular twitching / contraction
- which will leads to Spastic paralysis

Not metabolised By Acetyl cholinesterase

Acetylcholine not cause paralysis b/c it destroy by Acetylcholine esterase.

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(Alkaline Drug)

* If anything present in Blood & we want to Excrete/Remove it we do:
  1) Diuresis (Furosemide IV)
  2) Forced alkaline Diuresis:- Normally urine is Acidic (pH ≈ 6.5) we make it basic by giving Bicarbonate.

Fungal toxins

1. Aflatoxins 2. Ochratoxins 3. Citrinin

Fungal toxins :-

Also known as :- Mycotoxins

1. Aflatoxins :-

Produced by :- Aspergillus flavus

These are carcinogenic, mutagenic ↓ cause mutation in DNA.

Grow in :- [Caused By]
- Contaminated soil
- Decaying food such as
  i-Wheat ii-Rice iii-Peanuts iv-Corn v-Sunflower seeds
- Poultry :- If poultry is fed with contaminated food

Population Effected :- Childs are more susceptible b/c they play in the soil.

Types of Aflatoxins:-
1. Aflatoxin – B1 (most toxic)
2. — – B2
3. Aflatoxin – G1
4. — G2
5. Aflatoxin M1
6. — M2
7. Aflatoxicol.

In its Acute toxicity :-

Symptoms :- It is specially toxic to liver;
↳ Hepatic necrosis, cirrhosis, Hepato cellular carcinoma –
Death occurs due to acute liver failure.

Managment :- No specific Antidote. so we do
* Symptomatic & Supportive therapy.
- IV fluids

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2. Ochratoxins :-

Produced by :- Aspergillus flavus and Aspergillus ochraceus

Types :- 1. Ochratoxin A (more toxic)
2. — B
3. — C

Occurance :- Soil and food stuff as previously written.

It is carcinogic and nephrotoxic.

Historical Fact :- It occur only in Majorly Eastern Europe.

3. Citrinin :-

Produced by :- Penicillium

Occurance :- Contaminated Grain food (wheat, rice, maize)

- It can reach system circulation via skin. Percutaneous Absorption / Transdermal absorption.

Mechanism of toxicity :-

Lethal Dose :- 130 mg/kg (LD_{50})

- It is nephrotoxic, carcinogenic, mutagenic. It can cause DNA breaks, Oxidative damage & chromosomal abnormalities.
- It has the tendency to develop Adenomas on chronic exposure.

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Resin

Definition :- Resins are solid or semi-solid exudates (mostly from plants) formed in Schizogenous or Shizolysigenous ducts / cavities

Animal Resin

Shellac from insect.

Usually Occur :- in combination with other secondary metabolites

1) Oleoresin
2) Oleogum Resins
3) Gum Resins
4) Glycoresin
5) Balsam

Oleoresin

* Resin present in combination with volatile oil
  e.g Ginger, Capsicum

Examples:-

1) Oleoresin	Ginger, Capsicum	(V. oil + Resin)
2) Oleogum Resins	Asafoetida, myrrh	
3) Gum Resin	Gambage	
4) Glycoresin	Podophyllum, Jalap	(Glycoside + Resin)
5) Balsam	Tolu Balsam, Storax	Resin in which Balsamic acid present
	Peru — , Benzoin	

Balsamic Acid = • Benzoic Acid
• Cinnamic Acid

Chemistry of Resins:- Resin contains;

1) Resin Acid
2) Resin Alcohol
3) Resenes

Resin Acid :- The include oxyacids, carboxyllic & Phenolic Acids
They may be present in free or esterified form
They give reactions with Alkaline compounds
e.g Abeitic Acid
Pimaric —

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2) Resin Alcohols: 2 - types

Resinols
Resin in which tannins are absent
e.g Storesinol

Resinotannols
Resin in which tannins are present
e.g Sumaresinotannols

imp
3) Resenes :- • These are neutral compounds
• — — non-reactive (inert)
• — — Hydrophobic.
e.g Copalresene

Benzoin

Indonesia city

Synonym :- Siam Benzoin, Sumatra Benzoin, Gum Benjamin.
B.Name :- Styrax benzoin (Sumatra) لوبان = أزهر جاوي
Styrax tonkinesis (Siam)
Family :- Styraceae
Part used :- Exudate obtained via incisions into the stem of the plant.

Standard :- It contains not less than 25% balsamic acid calculated as cinnamic acid

C constituents :- • Cinnamic Acid (25 %)
(Free / Esterified form)
In sumatra benzoin cinnamic acid is double of Benzoic Acid.
In siam benzoin Benzoic acid is more than cinnamic Acid.

Esterified Form :-
• Coniferyl Benzoate
• — cinnamate
• Sumaresinotannol
• Sia — —
Sia resinolic Acid

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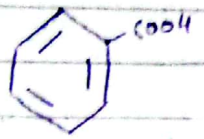
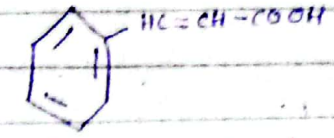
- Benzyl Benzoate
- Benzyl cinnamate
- Cinnamyl cinnamate



Benzoic Acid



Cinnamic Acid

Uses:-

1) Expectorant (Productive cough)
2) Anti-septic
3) Stimulant
4) Ingredient of Compound Benzoin tincture
5) Its inhalations are used to relieve respiratory discomfort.

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Asafoetida :-

Synonym :- Devil's dung, Heeng

B. Name :- Ferula foetida
Ferula rubricaulis
Ferula asafoetida

Family :- Umbilliferae

Part used :- Exudate obtained by making incisions in the roots and rhizome of plant.

Indeginous to :- China, Afghanistan, Pakistan, India.

C. Constituents :- * Oleogumresins
- V. oil (4-20 %)
- Gums (10-15 %)
- Resins (40 %)

Its odour is due to sulphur compounds present inthe V. oils of Asafoetida.

e.g Isobutyl propanyl disulphide

In its Resins ;
- Asaresinotannol
- Ferulic Acid (Free & Esterified)
- Umbellic Acid
- Umbelliferone (very small Quantity)

Uses :-

1) Carminative
2) Expectorant
3) Anti-Spasmotic
4) Laxative
5) Condiment.

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(Imp) Podophyllin → Resin of Podophyllum

Podophyllum :-

Synonym :- Mandrake, American mandrake, Mayapple

B. Name :- Podophyllum peltatum (American)
Podophyllum hexandrum Or (Indian)
Podophyllum emodi (Indian)

Family :- Berberidaceae (Old)
Podophyllaceae (New)

Part used :- Glycoresin obtained from roots and rhizome of the plant.

Indegimous to :- American, Canada, India, Pak.
High ellevation plant (ઊંચાઈવાળો)

C. Constituent :-

American	Indian
1. Resin (3-6 %)	1. Resin (6-12%.)
2. Active constituent of Resin = Podophyllotoxin – 20%	2. – 40 %
3. α - Peltatin (10 %) β - Peltatin (5%) } Resin	3. No Peltatin are present
Classified as Lignans	

Podophyllotoxins present in free form Or conjugated with sugar

Use :- Due to podophyllotoxins

1) Purgative b/c it is Gastric irritant and in higher dose it is very toxic

2) Anti-cancer

Etoposide, Teniposide } Product of podophyllotoxin in the market and used for cancer.

- Lung's cancer
- Ovarian cancer
- Kaposi's sarcoma
- Testicular –
- Ewing's syndrome

They are inhibitor of topoisomerase II (DNA Gyrase)
↓
Break the double stranded DNA. So the

II → \ / → \\ //

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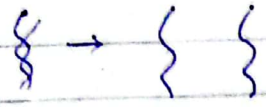
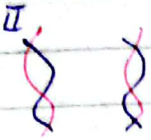
1) When the double stranded DNA separates



2) Other chain comes and bind to both strand - Also done by topoisomerase - II,



3) When the topoisomerase inhibition binding / Devigation not occur and drug comes and bind to these strands - DNA changes. When DNA changes, Apoptosis occur (Body killed its own cell)

* Podophyllum in older times used to treat the skin warts (ಚರ್ಮದ ಕಾಯಿ) → Escharotic

NOTE:- It is very toxic plants, toxicity on GIT. Vomiting, Diarrhea occur, BP ↓, Seizures and death.

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(viva)

Rosin :-

Synonym: Colophony resin

B. Name :- Pinus palustris
Pinus longifolia (Pak) Or Pinus roxburghii
Pinus halepensis

Family :- Pinaceae

Part used:- Oleoresin obtained from the bark of tree by making incision.

Collection & Preparation:- Long & weak incisions are made longitudinally into bark using knife or other sharp objects. A cup (metal/ copper) is placed beneath the incision for the collection of oleoresin.
The crude oleoresin is separated from the terpentine oil by steam distillation.

From Pine we obtain;
Turpentine oil (↓ B.P)
Rosin
Pine nut (چلغوزہ)

C. Constituents :- Resin Acid (90%)
Resenes (10%)
- Abietic Acid
- Pimaric Acid

Uses :- 1) Stiffening Agent in ointments & Plasters
2) In the manufacture of paints, varnishes & Polishes.
3) Sometimes used as Diuretics in veternary settings

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(Not imp)

Jalap :-

B. Name :- Ipomea purga
Family :- Convolvulaceae
Part used :- Olegum resin obtained from tuberous root or rhizome of plant.

C. Constituents :- * Resin (8-12%)
* Starch
* Gum
* V. Oil

Main constituent of Resin = Convolvuline (Free/Esterified)

Use :- Purgative

(Not imp)

Ipomea :-

Synonym :- Orizaba jalap
B. Name :- Ipomea orizabensis
Family :- Convolvulaceae
P. used :- Same as above.

C. Constituents :- * Resin (10-20%)
* Sugar
* Calcium Oxalate
* V. (volatile) Compounds
* Alkaloid (Scopoletin)

Main constituent of Resin = Jalapin
Jalapinolic Acid.

Use :- Purgative

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Myrrh :-

Synonym :- Arabian / African Myrrh
B. Name :- Commiphora molmol
Commiphora abyssinica
Family :- Burseraceae
Part used :- Oleogum resin obtained by making incision in the stem of the plant.

C. Constituents :-
- Resin (25 – 40 %)
- Gum (57 – 60 %)
- V. Oils (10 – 17 %)

* Main constituent of Resins are;
↳ α, β and γ Commiphoric acid
It also contain Resenes
* Volatile Oils Contains :
- Eugenol
- Lemonene
- Cuminic aldehyde

* Gum contains ;
- Proteins
- Galactose
- Arabinose
- Glucuronic acid

Uses :-
1. Carminative
2. Incense and perfumes
(اگربتی کے طور پر) → خوشبودار جلانے کے لیے.
3. Local Anti-septic
4. Topical Astringent
5. Mouth washes – For oral cavity infections.

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Cannabis :-

Synonym :- Chars, چرس, Hasheesh, گانجہ, Marijuana
Indian hymph

B. Name :- Cannabis sativa

Family :- Moraceae OR
Cannabinaceae

Part Used :- The resin obtained by rubbing or pressing
- flowering tops
- Leaves
- and sometimes stem also.

Ganja :- It is made from the large leaves, longer stems and fruits of the plant.

Bhang :- It is made from the leaves, stems and flowering tops of both male / female plants.
- The parts are dried and grounded (Gri بھنگ) followed by serving as liquid solution

Chars :- The Resin obtained from flowering tops of the live plants by rubbing or pressing.

Hashish :- The Resin obtained from dried flowering tops.

Before Drying	After Drying
Chars	Hashish.

Indeginous :- Pak, India, Neepal, Afghanistan.

C. Constituents :- Resins (15-20%)
↳ Compound of Resin — Cannabinoids
↳ More than 60 cannabinoids found in Resins

Cannabinoids :-
1. Cannabinol
2. Cannabidiol (CBD) useful
3. Camabigerol
4. Tetrahydrocannabinol (Δ^9-THC)

باقی خصلتیں اس گروپ سے ہیں۔

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Legal Policy :-

Govt. offer to cultivate Cannabis with low level of Δ^9.THC and with High level of Δ^9. THC is prohibited.

Uses :-

1. Anti-spasmodic
2. Anti-emetic
3. Anti-convulsant
4. Appetite Stimulant (بھوک لگاتا ہے)

Disadvantages :-

1. Narcotic :- It is a controlled substance ہے license ہر کوئی نہیں بیچ سکتا اس کا اپنا اس کی وجہ سب نہیں کر سکتے

   Control of Narcotics - 1997
2. Intoxicant نشہ آور
3. Causes physical & Psychological dependence.

Products :-

- Nabilone
- Dronabinol → Anti-Emetic (in chemotheraphy)

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Chromatography

Def :- Technique used for separation, isolation, purification and analysis of components of a mixture on the basis of differential distribution of analytes b/w St. phase and mob. phase.

Chromatography

	Also called Adsorbant	
	Stationary Phase	Mobile Phase
Physical State :-	Solid, Liquid	Liquid, Gas

When St. phase is;

Solid = Adsorption chromatography

Liquid = Partition —

* Polarity of St. phase & Mob phase should never same, it must be opposite. Generally St. Phase is more polar than mob. phase. Silical Gel (St. phase) is polar.

If St. phase = Polar
Mob. phase = Non-polar
→ Normal Phase Chromatography

If St. phase = Non-polar
Mob. Phase = Polar
→ Reverse phase chromatography. (HPLC)

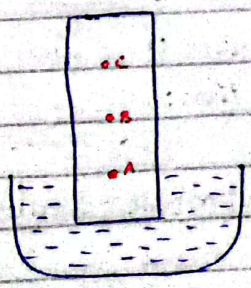
* ODS (Octadecylsylal) is put on the columns of HPLC to make it non-polar. Silica Gel is normally present on the column but to make it non-polar we use ODS.

St. phase

In normal Phase Chromatography :-

A is more polar so its affinity is more with St. phase (Polar) so it will deted first

And C is non-polar so its affinity is more with mob. phase



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Development:- Passing of mob. phase throug St. phase. OR Elution

* **Planar Chromatography:-** St. phase is present in the form of plane. (one-plane)
  e.g TLC, Paper Chromatography

* **Non-planar Chromatography:-** St. phase is present inside inside tube or column:-
  e.g Column Chromatography.

* **Two Dimensional Chromatography:-** Development in two direction. When mob phase moves in two direction. (may be at same time or not).

* **Ascending Chromatography:-** Mob. phase elutes the component from bottom to top
  e.g TLC, Paper chromatography

* **Descending Chromatography:-** Top to bottom
  e.g Column chromatography

* **Preparative Chromatography:-**
  - Sample quantity is more in kilo / like
  - Commercial purpose :- Isolation and purification
    ↳ 500 kg catharanthus have 5gm vinblastin.

* **Analytical Chromatography**
  - Less.
  - To determine the component and identify it.
    . ہم پتہ کرتے ہیں Vinblastin ہے

Eluent:- Mobile phase
Eluate:- Mixture separated by elution
Elution:- Passing of mob phase over St. phase.

Elutrophic Series:- Hexane, Cyclohexane, Benzene, Dichloromethane, Chloroform, (Anhydrous) Ether, Ethyl acetate, Acetone, Methanol, Ethanol, Pyridine, Acetic Acid, Water.

-ہم T/F . ہیں آتے MCQs سے اس . ہے یاد کرنا لئے Exam میں order اس،

Order of increasing polarity.

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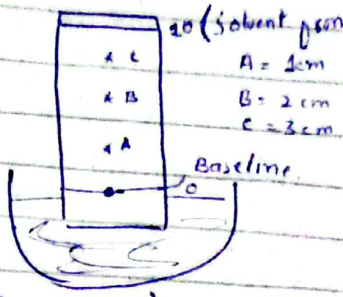
Rf Value :- Physical No. use in planar chromatography. Mob. phase travels against the gravity through capillary actions.



$$Rf = \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent front.}}$$

- Distance record from Baseline (جہاں sample ڈالا).
  In HPLC distance records from O.
- Solvent front :- جہاں تک Solvent گیا ہے.

Maximum Rf = 01 **Minimum Rf :- 0**

اگر 01 سے آگے آجائے تو اس کا مطلب Solute نے solvent سے آگے چلا گیا.
جو کہ Possible نہیں ہے.
اگر 0 آجائے اس کا مطلب Travel نہیں کیا۔

Rf value depends on:- ~~Stationary Phase~~
mobile Phase (mostly)

e.g Nicotine have Rf = 0.5 it can change by changing mobile phase

Column Chromatography

Developed 1st of all in 1906 by Mikhail Tswett.

Def :- Same as of chromatography but in last work in a column.

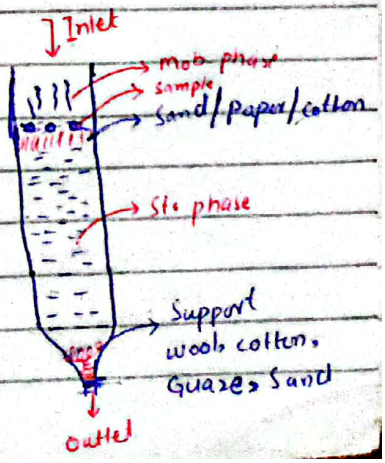
Principle of Separation :-

* For solid St. phase ⟶ Adsorption

Small quantity of mob. phase is always present on st. phase (if sample present or not) to keep it wet.

Mob. phase is relatively non-polar than St. phase — Normal Phase chromatography

If sample is present on top of column



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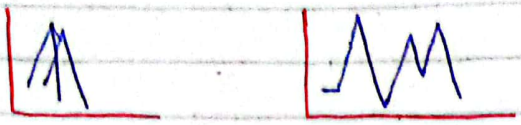
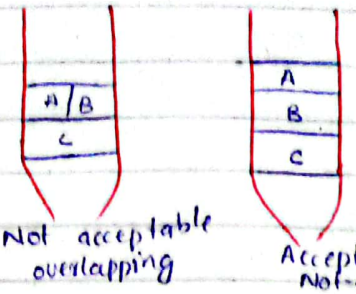
and mob. phase is pd, then analyte leavel with the mob. phase, and separated components are present as band which are not overlaped but separated fully.



Not Acceptable overlaped

Acceptable Not-overlaped.



Not acceptable overlapping

Acceptable Not-overlap.

Separated components are observed, that C is more non-polar than A b/c its affinity is more with mob. phase.

Analyte which have affinity with St.phase will adsorp earlier and will separate first. On the contrary those analyte of mixture which have less affinity with St. phase will adsorpt slowly, travel more and present at the bottom of column.

Earlier Eluate :- Non-polar Analyte

Later — :- Polar —

* For Partition Column Chromatography

(St. phase → Liquid)

Mob. → Liquid / Gas

When both St. and Mob phase are liquids and are immiscible and sample also present so analyte which have more solubility with St. phase will separated

↓

Sample will distributed in both phase on the basis of partition co-efficient/ Distribution co-efficient

$K = \frac{\text{Sample conc. in one layer (organic)}}{\text{Sample conc. in other — (aqueous)}}$

$K = \frac{C_{org}}{C_{aqu.}}$

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If partition co-efficient of a sample in lower so it will move slowly

Earlier Eluate :- Non-polar analyte

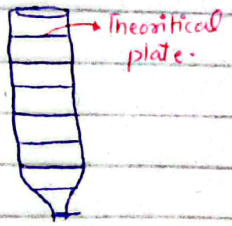
Later — :- Polar —

* Principle ہے اس کا point تک پہنچنے کے لیے کتنا وقت لگتا ہے

Column Plate theory :- Theoritically exist not practically.

According to this theory :-

"Column is made of many theoritical plates which are smooth and horizental."



- Theoritical plate presents site of action b/w St. phase and mob. phase
- No. of theoritical plates ∝ Chromatographic separation. (Better)
  - Greater distance b/w two bands
  - — — b/w — peaks
  - Sharp peak

HETP = L (length of column) / N (No. of theoritical plate)

Height equivalent to Theoritical plate

Packing of Columns

- Filling of column with St. phase
- 2-technique

1) Dry technique :- St. phase or Adsorbant is packed in the column in dry form.
   - Solvent is added after the filling.
   - Solvent addition is done till equilibrium is reach i.e solvent reaches all parts of Adsorbant.

Disadvantages - Empty spaces remain in Adsorbant
Not uniform mixing

Tapping is soln. to fill empty spaces

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2. Wet Method:- Most commonly used.

- Adsorbant is mixed with solvent to form a slurry.
- The slurry is added to the column in portions
- Proportion of Adsorbant & Solvent is generally 2:1 Or 3:1 (more parts of Adsorbant)

Disadvantages :- Pourability problem.

(Quantity of $\frac{\text{water}}{\text{solvent}}$ increase to improve pourability)

- The st. phase settles uniformly without cracks
- The extrasolvent rises to top above absorbant

Elution (important)

Pass mob. phase from St. phase.

Def :- Discussed previously

Types :- 1) Isocratic elution
2) Gradient —

1) Isocratic Elution:-

Def :- When a mob phase of const. conc./(ithem compos) polarity use throughout the elution.

e.g Hexane : Chloroform : Ethanol
5 : 2 : 3

2) Gradient Elution:-

Def :- When there is constantly change in conc. /compl polarity of mob phase.

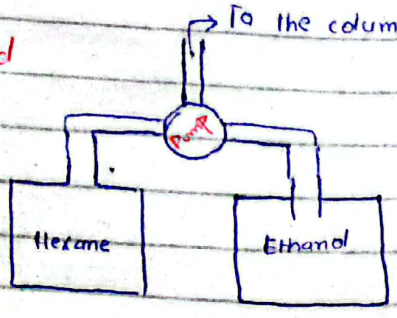
e.g

Hexane	:	Ethanol
80	:	20
75	:	25
70	:	30
65	:	35

- Polar compound also separated
- Greater no. of compound —

How conc. change?

Computerized. Set conc. for time in computer



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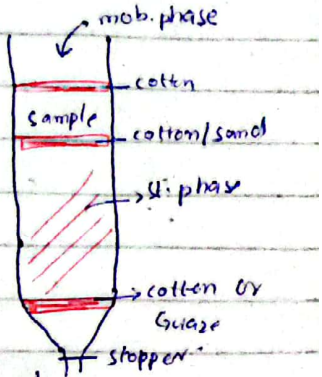
Procedure:-

1) Sample Loading:-
Mix sample with solvent (mob. phase)
The soln. made placed above the adsorbant.

2) Assembly :- Digram explaination.



3) Elution trend :- Elute first or last
- ہم اس کو Discuss کریں گے

Applications of Column chromatography :-
1) Isolation of constituents from mixture. of sample.
2) Purification & conc. of analyte from a diverse mixture such as crude drug extracts.
3) Determination of the desired chemical compound or its metabolite in body fluid.
4) Determination of drug (Active pharmaceutical ingredient) in various formulation.

Thin Layer Chromatography

Def :- It is a technique of chromatographic separation in which components of a mixture are separated due to their relative affinity b/w liquid mob. phase & solid st. phase adsorbed onto a plate.

- Type of adsorption chromatography.
- Very convenient, easy and less time consuming } Advantages
- Cost-effective (سستا ہے)
- Not use for isolation of constituent, use for Qualitative determination of compounds.

Use of mob. phase in column chromatography decision made on TLC. First TLC done and compand constituent

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It is performed on a sheet of glass, plastic or Aluminium foil covered with thin layer of St. phase such as Silica Gel, Alumina, Cellulose

Principle:- Principle of separation is Adsorption. Partition ہے لیکن یہ بالکل Adsorption کی طرح ہے، یہ Column (Bottom to top) direction کے Separation والا طریقہ ہے یہ کام کرتی ہے۔

- Mob. phase travels from bottom to top Capillary Adion due To
- Polar analyte easly adsorb while non-polar analyte adsorp later.
  - Pores
  - Surface tension

Requirements:-

1. St. phase
2. Plates
3. Preparation of TLC Plates
4. Sample loading
5. Development
6. Mobile Phase
7. Detection
8. Calculation of Rf.

1. Stationary Phase :-

* Commonly used St. Phases are:
  1) Silica Gel 2) Aluminium oxide 3) Calcium carbonate 4) Cellulose. 5) Cellulose derivative (Ethyl / Propyl cellulose) 6) Magnesium -
* Adsorbant is mixed with water before application on the plates.
* Silica Gel is the most commonly used Adsorbant.

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Plates :-

Construction material :- Glass, Plastic sheets & Aluminium foil

Dimensions :- 20 x 20 cm → Square
20 x 10 cm → Rectangle
20 x 5 cm → Rectangle

Preparation of plates :-

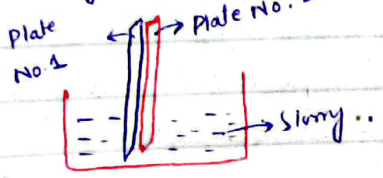
- The slurry of St. phase prepared in water is added onto the plates by following methods;

1. Paring 2. Dipping 3. Spreading 4. Spraying.

1. **Pouring :-** Slurry is poured over the plate placed on smooth horizental surface. It is ensured that all of the plate is covered with the slurry.

Disadvantage :- Uniform thickness is not obtained.

2. **Dipping :-** Dip plate inside slurry, only one side of plate should covered with slurry.
Place Or Attach two plates sideways and dipped into the slurry



Disadvantage: Uniform thickness around the corner is not obtained.

3. **Spreading :-** Slurry is placed in the TLC reservoir. Thickness of the layer is generally kept 0.25cm for analytical purpose and 2mm for preparative purpose. The spreader is then allowed to roll on the plate. Thickness of the plate is adjusted by changing distance b/w Spreader and plate.

4. **Spraying :-** Prepare dilute slurry. And spray by nozzle to the plate.
- Not use commonly.

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Activation of Plates :- Drying of plate is activation. Plate is dried in oven (100 – 110°C) for an hour. By drying, moisture and other substance are removed from plates and sites of physical attachment also removed. and become activated. for other compounds.

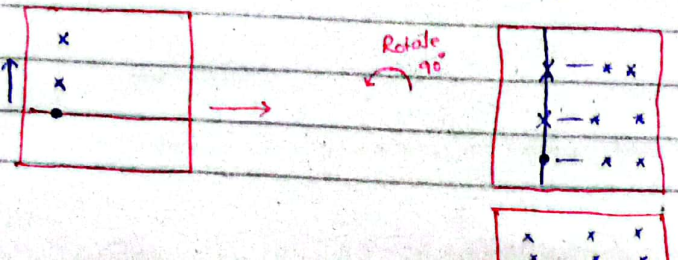
* **Sample Application:-** Generally 2 – 5ml of 1% soln. of sample mixture is spotted on the base line of TLC plate using capillary tube / Dropper / micro-pippette. The baseline is kept 1 – 2cm above the bottom of the plate. The spot should not immersed in the mob. phase. 2 – 3 spot can be placed on a single plate.

* **Development :-** It is carried out in a development tank / chamber. Mob. phase is added to the tank. followed by plaing a lid over it. After 20 – 30mins of acclimatization, TLC plate is plate in tank &
  - Whole environment about mob. phase is like the mob. phase.

  - لیئے Adjust کو Environment کے ساتھ Enviint. کو mob.ph کے بخارات جا سکیں۔ Jar میں lead is placed again.

One Dimensional Development :- Mob. phase. passing through plate in vertical direction leading to separation of analytes. is one - dimensional development.

Two Dimensional Development :- In this technique, more complex mixtures are separated. It is done by developing the plate in vertical direction followed by Horizental development.



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Mobile Phase:- Selection of mob. phase depends on;

i- Nature of analyte
ii. - - St. phase
iii- Type of chromatography (Normal Or Reverse Phase)
iv- Separation to be acheived (Analytical Or Preparative)

For Sample containing non-polar analytes in normal phase chromatography, non-polar mob. phase is prefered.

For sample containing relatively non-polar analytes in reverse phase chromatography, Polar mob phase is prefered.

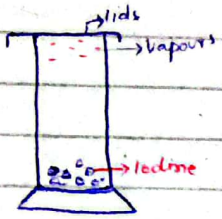
Detection:- Generally the spots of analytes are visible. The coloured visible spots are encircled with pencil, pen, Sharp object.

For visualization of spots not visible to naked eye, following methods are used;

i- UV- Radiation
ii- Iodine chamber

i- UV Radiation:- The TLC Plate, after development, is placed in UV lamp to observe any separated analyte.

ii- Iodine Chamber:- The TLC plate, after development, is placed in a closed container, saturated with iodine vapours for 4-5 mins. Plate is then taken out of container to observe any brown spots followed by their proper marking or encircling.



Generally when iodine vapourized produce brownish color and produce brown color on plate.

Specialized Visualizing Agents:- Sprayed.

i- Molish Reagent ⟶ For Sugars
(α-napthol)
ii- Nin- Hydrin reagent ⟶ For Amino Acid
iii- Dragendorff's reagent, ⟶ For Alkaloids
Hager's Reagent &
Mayer's Reagent
Feric Chloride soln. ⟶ For Tannins

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* Rf :-

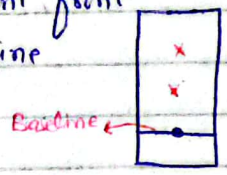
Stands for :- Retention factor Or Retardation factor

Mathematically :-

$$Rf :- \frac{\text{Distance travelled by solute}}{\text{Distance travelled by solvent}}$$

(ఎంత దూరం solvent) → - - - solvent front

- Calculate distance from baseline



Rf Range :- 0 to 1

Depends upon :- Nature of mobile phase.

- One substance has different Rf if mob. phase changed.

Rf is specific to mob. phase.

Better Rf value :- B/w 0 and 1

0 = No Separation

1 = Along with solvent. ఎక్కువ Separation

Applications of TLC :-

i. Identification of analytes in sample

ii. Analysis of drug residue & Antibiotics in various samples

iii. Identification of colouring matter, preservatives & flavours present in food products.

iv. Quality control and testing of pharmaceutical formulation

v. Analysis of environmental samples to detect the presence of pollutants, toxins & drugs

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Paper Chromatography

Definition:- It is a technique of chromatographic separation in which components of mixture are separated b/w the liquid mob. phase and liquid st. phase present in the specialized paper.

* It is a type of partition chromatography and normal phase chromatography.

Principle:- Paper chromatography is partition chromatography and st. phase is water molecule entrapped / absorbed to cellulose and present in the spaces b/w cellulose molecules. Paper serves as solvent support for st. phase. Analytes will partition b/w liquid st. phase & liquid mob. phase on the basis of their partition co-efficient

Partition co-efficient:-(K)

More non-polar analytes → • High K
• Travelled more.

More Polar analytes → • Low K.
• Travelled less

Requirements:- 1) St. phase and paper 2) Mob. phase
3) Developing chamber 4) Sample application
5) Types of development 6) Detection agent
7) Calculation of Rf.

1. **St. Phase & Paper:-** Whatman's filter paper of Grade 1, 2, 3, 4, 20, 40 etc.

Other modified paper's include
i- Acid treated / Base treated paper
ii- Glass fiber type paper
iii- Hydrophilic papers (Paper's treated with methanol, Glycerol etc)
iv- Hydrophobic - (Produced by Acetylation of cellulose in the paper)
↳ Use for reverse phase chromatography

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* In general paper's contains
  - 98 % α - cellulose
  - 1-2 % β - cellulose.

2. Mobile phase :- Pure solvents, Buffer solutions or mixture of solvent's can be used.
- If pure solvents do not give satisfactory separation, mixture of solvents having suitable polarity is used.

Example:-

n-Butanol	: Glacial Acetic Acid	: water	Hydrophilic
4	: 1	: 5	
Cyclohexane	: Ether		Hydrophobic
6	: 4		

3. Developing Chamber :- Made up of :
- Glass
- Stainless steel
- Plastic

- They vary in size and shape
- Before starting chromatography, the developing chamber is allowed to saturate with the vapours of Mob. phase / Solvent to provide uniform ambient condition.

4. Sample Application :- The solid samples are dissolve in solvent. Conventionally spot is applied near the bottom of the paper using a capillary tube Or micro-pipette / Dropper.
The spot is air dried before placing the paper in the chamber.
The spot marks the baseline for calculation.
- - is applied 1-2cm above bottom.

5. Development :- The paper is placed in the saturated developing chamber. The lower edge of the paper dips into the mob. phase. The spot should not dip into mob. phase.

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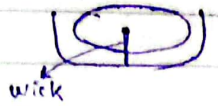
Types of Development :

i- Ascending Development :- Conventional type (R_f)
Spot is applied near bottom. Mob. phase flows in upward direction against gravity through capillary actions

ii- Descending Development :- The sample spot is applied near the top of the paper. It is carried out in a specified developing chamber in which the solvent/ mob. phase flows down the paper (Along with the gravity)

iii- Circular Development :- Also knowns as Radial Development. Spot is applied in the center of circular filter paper. The mob phase / solvent flows horizontally through the paper via wick



6. Detection Agent :- Same as written in TLC.

7. Calculation of Rf :- - - - - -

Applications of Paper Chromatography

1. To determine the purity of pharmaceuticals
2. For the detection of Adulterants & contaminants in food and cosmetics.
3. For the detection of Allerginic compound in food & cosmetics
4. For analysis of drug & their metabolites in body fluids.
5. Also used in fruit ripening studies.
6. To determine the completion of reaction in a reaction mixture in laboratory setting.

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Nutraceuticals

In Pakistani Law :- Nutraceutical, Food supplement, Health supplement and dietary supplement all are same — DRAP - 2012

Definition :- Nutraceuticals or Food supplements or Dietary or Health supplements means products containing vitamins, pro-vitamins, multi-vitamins, mineral including of mineral salt, a naturally occuring minerals, metals & their salts, a lipid including an essential FA or phospholipid, Amino acid, proteins, carbohydrates, mucopolysaccheride, plant or herbal material including fibers, enzyme, algae, Fungi, cellulose and its derivatives, herbal preparation, Resin, Balsam, Volatile oil, Non-human animal material including dried material, bone, cartilage, fats and other extracts, a micro-organism, whole or extracted, except juices, exudates etc alone or their combinations; are presented in pharmaceutical dosage form intended for health related purpose.

OR

Products of natural origin that can be used as pharmaceuticals and therapheutic alternative, in addition to its natural health benefits.

Functional Food :- Food products which are enriched with certain vitamins, minerals or other beneficial substances to provide extra health benefits.

Example :- Ghee with vitamin A and D

Fortified foods and milk → enriched with supplement

Nutraceutical include :- - 3 categories

1) Dietary fibers
3) Vitamins & minerals
2) Probiotics

Food product include beneficial bacteria used to restore the normal flora

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Pro bio
for life

Probiotics

* Definition :- According to WHO probiotics are live micro-organism which when administered in adequate amount conjers a health benefit to human being.
Live microorganism :- Bacteria

* Most famous Probiotic :- Lactobacillus, Bifidobacteria

* The concept base on the fact that; Yougurt
Those people who consume sour milk they live longer and healthy as compared to other.

* Foods containing Probiotics :-
1) Yougurt 2) Pickled vegetables 3) Kimchi (Korea)
4) Miso soup (Japan)

* Individuals who needs Probiotic :-
1) People suffering from inflammatory disorder of GIT
2) People with weak immune system

• Normal flora (Micro flora) starts from jejunum upto small large.
present only in jejunum — Large intestine
• Most of the flora are Gram +ve.
4 Aerobic bacteria greater in no. in initial portion of Large intestine
4 Aneorobic — - - - Last - - -

* How Probiotics Are Useful to Us?
Small amount of yougurt when added to milk. Lactose of milk change into lactic acid (oxidation occur)
Lactobacillus changes lactose into lactic acid. Lactic acid reduces the pH. if it is present in intestine The pH of intesine reduces.
Certain proteolytic bacteria not grow in acidic environment such as Clostridium difficile / perfringells, Salmonella Shigella.

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Role of Probiotic in immunity:-

1) They have been found to increase the secretion of IgA [present in body fluid]
2) They Yes the expression of mucin

Mucin Gene ⟶ mucin protein ⟶ Mucus
↓
Form barrier against ba

General Uses of Probiotics:-

1) Managment of lactose intolerance
2) Antibiotic associated diarrhea.
3) Managment of H-pylori ulcer infection b/c it Yes the expansion of mucus.
4) Managment of inflammatory & allergic disorder such as Asthma.

Prebiotics

Pre . bio
Before life.

- Prebiotics are not living things
- Prebiotics are required for Probiotics, basically it is food for probiotics.

Foods which are not absorbed are good for probiotics. so prebiotics are non-absorbable
e.g Fibres, Green vegetables.

Dietary Prebiotics:-

- According to International Scientific association of Probiotics and prebiotics, Dietery prebiotics are selectively fermented ingridients that result in specific changes in the composition or activity of micro flora, Thaus conferring benefit to Human host.

/ breakdown.

- Digestion of fibres done by beneficial bacteria. so prebiotics result in Yes in beneficial bacteria. b/c they are food of beneficial bacteria.

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* Fibres are made up of cellulose and cellulose composed of carbohydrates. Prebiotics break it into smaller chain oligo/ monosaccheride. and those chains are oxidised and convert it carboxylic acid called Short chain Fatty acid (very beneficial)

Oligosaccheride $\xrightarrow{\text{oxidised}}$ Short chain FA

↓

Reduce the pH

↳ Lactulose also reduce the pH and use in Hepatic encephelopathy.

Criteria for Prebiotic :-

1) It should be resistant to stomach acids
2) It can be fermented / digested by microflora
3) Its fermentation results in selective growth of blood micro flora

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Vitamins & Minerals

Fat soluble | water soluble

Fat soluble :- They include A, D, E and K

Vitamin A :-

Also called :- Retinol

Advantages

1) For eyes
2) — Skins
3) — Acne
4) Growth and development

Vitamin D_3 :- جسم میں Body کیلئے

Also called Cholicalciferol

Activated form Calcitriol

Advantages :-

1) Bone development, Growth & Shength
2) Enhances Ca^{+2} Absorption

Vitamin - E :-

Also called :- Tocopherol

Function :-

1) Anti-oxidant
2) Free-radical scavenger
3) Managment of infertility.

Vitamin - K :

Also called :- Phylloquinone — (Vitamin K_1)

Function :-

1) Helps in Blood clotting

It acts as co-enzyme in the synthesis of clotting

Some of microflora also synthesize vitamin-K factor

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Vitamin B-complex, C

Vitamin - B_1

Also called :- Thiamine

Importance :-

1) Regulation of metabolic path ways
2) — — Energy metabolism

Vitamin - B_2 :-

Also called :- Riboflavin

Importance :-

1) Helps in proper function of Eye. b/c it synthesize Rhodopsin.
2) Inflammation of lips and mucus membrane - Stomatitis
Helps against.

Vitamin - B_3 :-

Also called :- Niacin

Importance :-

1) Neurological function.
2)

Vitamin - B_6 :-

Also called :- Pyridoxin

Importance :-

1) Roles in various neurological pathway.
2) Synthesis of GABA.
3) Sleep Regulation.

Vitamin - B_{12} :-

Also called :- Cyanocobalamin

Importance :-

Maintenance of RBC shape. - Its deficiency cause Pernicious anemia

Folic Acid

Also called :- B-9

Importance :- Its deficiency cause pernicious anemia. megaloblastic —

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Vitamin - C :-

Also called :- Ascorbic Acid

Importance :-

Anti-oxidant

Free radical scavenger

Wound healing.

Gum and teeth health

Minerals

Importance

Iron :- Synthesis of Hb and O_2 transport

Calcium :- Maintenance of bone density & muscle contraction

Phosphorous :- Synthesis of ATP

— — Nucleotide, DNA

Strength — Teeth

Cobalt :- Synthesis of vitamin - B_{12}

Iodine :- Proper function of thyroid gland

Copper :- Hemoglobin and collagen production

Zinc :- Improve growth (cell division)

Zinc sulphate gives to child in diarrhea.

Phytochemicals

1) Ginseng :-

Botanical Name :- Panax ginseng

Part used :- Roots

Constituent :- Gensenosides

Importance :-

1) Improves vitality

2) — Strength

3) — cognition

2) Ginkgo :-

Botanical Name :- Ginko biloba

Importance :- It Pes blood supply - and also above (3)

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Importance . Present in fruits .

Carotenoids :- Anti-oxidant , Free-radical scavenger
Anti-aging Vitamin-A precursor

Flavonoids :-

- Polyphenolic compounds
- Present in tea, coffee, vegetable, Fruit peels

Imp :- Anti-oxidant . Free .

Phytosterols :-

Imp :- Anti-inflammatory Immunomodulatory
↓es Blood cholesterol

Present in :- various plants.

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